

Original Research Article

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Influence of Age at First Calving on Milk Quantity at Holstein-Friesian Cows

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A study has been held in two farms (A and B) with cows of Holstein-Friesian breed. The farms included in the study are divided in diet and breeding. The animals were divided into groups according to age at first calving. The age of first calving for each group in the two farms has been traced. This study aims to track the age of first calving in cows of Holstein-Friesian breed and milk quantity on first lactation in both farms. The survey results indicate an optimal age for first calving at Farm A - 24 months of age, and for Farm B - 29 months of age. In the respective ages the total milk is highest.

Introduction

The age of first calving is one of the main factors influencing the total milk in cows on first lactation. From the factor “age” depends on the realization of genetic potential for high milk yield (Nilforooshan and Edriss 2004), and the effectiveness of dairy farms (Tozer and Hendrichs, 2001).

Recommendations for age at first calving referred in the literature are too contradictory. In a study of Gergovska (2011) had been established average age of first calving - 30 months, which according to other authors (Petraskiene *et al.*, 2007) it is too high. Pirlo *et al.* (2000) established average age 28 months to a study in Italy, Perez *et al.* (1999) 28.6 months in Spain, Hare *et al.* (2006) 27 months in USA and

Nilforooshan and Edriss (2004) 27 months in Iran.

In countries like the Netherlands there is a tendency for insemination of dairy heifers before 15 months of age (Mourits *et al.*, 2000), and the factors on physiological development is not taken into account. Other authors (Haworth *et al.*, 2008) give optimal age of first calving in Australia - 2.5 years (30 m.), noting that these animals have high milk yield of first lactation and prolonged period of economic use. Tozer and Hendrichs, (2001) recommended average age of first calving at 24 months weighing 560 kg., while Гайдарска и кол. (2008) link age of first calving 25 months, while cows at that age have a long period of economic use

and lifetime milk yield. These data are confirmed by other authors (Tozar and Hendrichs, 2001).

With increasing age Гайдарска и кол. (2008) found deterioration of reproductive and productive performance. Impact on age at first calving have breed, age of first heat, management, nutrition and live weight (Кръстев 2002, Русев и кол. 2001). Кръстев и кол. (2002) recommended age of first calving at 28 months for milk breeds with a strong genetic potential for high milk yield

According to Penev *et al.* (2014) for optimum economic efficiency it is considered to breed heifers at 15-18 m. and respectively calving them from 24.5 to 27.5 months.

With this study we aim to track the age of first calving in cows of Holstein-Friesian breed on two farms and milk quantity in their first lactation

Materials and Methods

A study was held with cows of Holstein-Friesian breed. The study included two farms: South Central region (Farm A) with 84 cows and Southeast Region (Farm B) with 51 cows. Animals are bred by free cubicle household technology with separate beds for relaxation in both farms. The difference between the two farms in the technology of feeding and breeding. Animals in Farm A are breed completely in barn conditions and the Food trail is located in the barns. Farm B has a yard where is located the food trail to distribute feed. Table 1a and 1b are presented daily rations for the two farms. Of these, it is seen that rations differ both in composition and content of nutrients and energy. For farm A energy and protein value are respectively

25.57 KEM and 3410 g., And for farm B respectively 24.77 KEM and 4307.8 g.

During the study are tracked the health of animals, the age of calving and quantity of milk for first lactation. Statistical data processing was carried out with Excel to Microsoft Office Professional plus 2010.

Results and Discussion

Daily rations to feed the cows are presented in Table 1a and 1b. It shows that they differ in the composition and amount of nutritional value, respectively. Ration for animals in the farm A (Table 1a) is according to daily milk yield of 35 l, and ration of Farm B (Table 1b) for daily milk yield 30 l.

The results are presented in Table 2a and 2b. Data show that the age of calving on farm A range within 23-29 months. These findings coincide with those described by Petraskiene *et al.* (2007), Pirlo *et al.* (2000), Perez *et al.* (1999), Hare *et al.* (2006), Nilforooshan and Edriss (2004) Gaidarska *et al.* (2008) and Penev T *et al.* (2014). From the results it can be seen that the highest average milk yield (7923 l) in first lactation is achieved at the age of first calving of 24 months (tested 19 animals) where the maximum milk yield is 12,632 l, and minimum 1382 l. The variation in milk yield index is high regardless that the age of calving is the same. Perhaps the reason is assessment of body condition in animals bred in the group, as well as the relationship between reproductive and productive indicators identified in our previous study (Popov *et al.* 2015).

The results in Table 2a shows that at the age of calving 29 months animals have the lowest average milk yield 5176 l (tested six animals), and the highest and lowest milk yield are respectively 6218 l and 4611 l. The data obtained for Farm A show high SD

because of wide variation in milk yield in groups.

For farm B (Table 2b) age of first calving ranges 28-36 months and the optimal average milk 5244 l is obtained at 29 months age at first calving. The lowest amount 2706 l is at age 28 months and the number of animal is small: 6 calved heifers is 29 months old and 9 heifers calving at 28 months.

From the comparison of the two companies in terms of index age at first calving and

total milk shows that farm located in the South Central region has a better performance in the tested indicators although the variation in the amount of milk is high in SD (2616).

Perhaps these indicators are due to the technology and higher nutritional indicators 35 l milk yield. Similar to our results have been obtained by other authors (¹Penev T *et al.*, 2014; ²Penev T *et al.*, 2014 and Penev Toncho *et al.*, 2014) taking into account the quantity and quality of milk.

Table.1a Average Daily Ration of Cows in Lactation (Farm A)

Type of fodders	Kg	DM, kg	E, KEM	CP, g	BPR, g	Ca, g	P, g
Straw	0.6	0.5	0.29	18.6	-27	1.8	0.4
Corn silage	28	8.4	8.68	728	-224	31.9	18.2
Alfalfa hey	3.5	3	2.45	570.5	161	46.9	7
Combined feed	11.5*	9.8	14.15	2093	322	90.9	40.3
Total:	43.6	21.7	25.57	3410	232	171.5	65.9

*one kg compound feed containing: DM - 0.85 kg., Energy - 1.23 KEM, CP – 182 g., BPR – 28 g., Ca - 7.9 g., P - 3.5 g

Table.1b Average Daily Ration of Cows in Lactation (Farm B)

Type of fodders	Kg	DM, kg	E, KEM	CP, g	BPR, g	Ca, g	P, g
Hey	2	1.74	1,46	228	26	12,00	4,88
Straw	1	0.87	0,48	31	-45	3,05	0,70
Corn silage	18	5.4	5,58	468	-144	20,52	11,7
Corn- grain	3,5	4	4,73	311,5	-126	0,91	9,73
Wheat	1,5	1.3	1,89	193,5	-25,5	0,78	5,48
Combined feed	12.05*	11.9	10.63	3075.8	865.9	91.37	90.3
Total:	38,05	25.21	24,77	4307,8	551,4	128,63	122,79

*one kg compound feed containing: DM - 1 kg., Energy – 0.9 KEM, CP – 255 g., BPR – 72 g., Ca - 7.6 g., P – 7.5 g

Table.2a Age of First Calving and Milk (Farm A)

Months of calving	Number of animals	Amount of milk /liters/	
		$\bar{x} \pm S \bar{x}$	SD
23	9	7000 ± 683 ^a	2050
24	19	7923 ± 600 ^a	2616
25	24	5610 ± 622 ^a	3048
26	14	6864 ± 708 ^a	2650
27	8	6466 ± 891 ^a	2521
28	6	6362 ± 1434 ^a	3513
29	6	5176 ± 231 ^a	56

SD –Standard Deviation, a – significant $P \leq 0.001$, b –insignificant $P \geq 0.001$

Table.2b Age of First Calving and Milk (Farm B)

Months of calving	Number of animals	Amount of milk /liters/	
		$\bar{x} \pm S \bar{x}$	SD
28	9	2706 ± 341 ^a	102
29	6	5244 ± 819 ^a	2006
31	10	3472 ± 493 ^a	1560
32	6	3283 ± 866 ^a	2121
34	8	4057 ± 480 ^a	1358
35	6	3662 ± 505 ^a	1237
36	6	4987 ± 870 ^a	2132

SD –Standard Deviation, a – significant $P \leq 0.001$, b – insignificant $P \geq 0.001$

For farm A is typical that the predominant number of cows involved in the study has calved at age 24-25 months and for farm B - 31 months.

Compared the two farms in terms of age at first calving can be seen that farm B has a higher age at first calving in relation to farm A. Data on farm B were similar to those cited by Haworth *et al.* (2008) about calving age, but differ in milk yield indicator. Authors offer optimal age at first calving 30 months at which has highest milk yield.

The data obtained from farm A support research of Petraskiene *et al.* (2007) and Penev T *et al.* (2014), etc., In their case the

optimum calving period is 23-24 months.

Our results do not match those described by (Haworth *et al.*, 2008), which provides data for optimum milk yield of first lactation at first calving age of 30 months.

Data between the two farms were statistically significant at $P \leq 0.001$.

In conclusion, a difference in age at first calving between the two farms has been established. At farm A the age is 23-29 months and for farm B it is 28-36 months.

The maximum quantity of milk for the first completed lactation produced under the age

of first calving of 24 months (7923 l) in farm A and 29 months of age on farm B (5244 l).

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