

RESEARCH REGARDING THE CHARACTERISTICS OF MILK PRODUCTION OF HOLSTEIN-FRIESIAN COWS IN CONDITIONS OF SOME FARMS FROM MOLDOVIAN REGION

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Abstract

This research aims to determinate the milk production characteristics for the standard lactation in Holstein-Friesian cattle based on data from six farms from Moldavian region. The following characters were observed: age at first calving, milk yield, fat yield, fat percentage, protein yield and protein percentage. The primary data was processed according to the ICAR guidelines, and later was processed statistically through the S.A.V.C. software. At the end of processing, the following averages were obtained: 731.8 days – 868.49 days for the age at first calving, 7304.86 kg – 10596.08 kg for the milk yield, 3.71% - 4.45% for the percentage of fat, 312.8 kg – 406.13 kg for fat yield, 3.19% - 3.31% for protein percentage and 237.6 kg – 337.51 kg for the protein yield.

Key words: Holstein-Friesian, age at first calving, milk, protein, fat

INTRODUCTION

As is known, the main objective in animal breeding program for cattle breed population is to improve its genetic structure so that the economic efficiency of cattle increases more and more.

One of the step in the animal breeding programs represents establishment of the morpho-productive characteristics and genetic parameters for the studied population. Values of these parameters will later influence the direction of the improvement works. From the production characters the main traits are: age at first calving, milk, fat and protein yields, fat and protein percentages. The genetic parameters are known as heritability and repeatability coefficients and correlations between the traits that are studied on a specific population. These parameters inform about the genetic gain that can be brought to a population that already has a certain phenotypic value, about the degree to which a certain trait is free from the influences of temporary environmental or about the

development direction that is imposed by a trait on another one.

In the literature the heritability coefficient has values ranging from: 0.15 to 0.47 for the milk yield, 0.15-0.39 for the fat yield, 0.13-0.40 for the protein yield. The repeatability coefficient for these traits in successive lactations varies from 0.18 to 0.89. A high repeatability coefficient for these traits suggests that results for following lactations can be predicted based on the results obtained in the first lactation, therefore the purpose of this paper is to determine the performance of cows at the first lactation from six farms and for six traits [1], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13].

MATERIALS AND METHODS

The biological material was represented by 667 Holstein-Friesian cows from six farms in the Moldavian region.

Data on milk production traits were obtained from the Holstein Ro association. There the milk samples were processed thorough the Combifoss aparat and, after that, were applied methodologies for the calculation of milk, fat and protein yields for 24 hours and standard lactations (305 days)

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presented in the ICAR Guideline [14]. Samples were taken monthly from each farm and each cow. From the total number of registrations were excluded cows affected by various diseases such as mastitis or problems with the udder, cows lacking the dry or calving date, those who had under 7 completed controls and those who missed more than two successive controls.

The statistical analysis was made at the Faculty of Animal Husbandry in Iasi through the S.A.V.C. (Statistical Analyse of Variance and Covariance) program. It aimed to obtain the following statistics: population average, standard error of the mean, coefficient of variation, minimum and maximum limits for the first lactation at six traits: age at first calving, milk yield, fat yield and percentage and protein yield and percentage.

The obtained results are part of a larger study aimed to determinate a selection index for milk production traits in six Holstein-Friesian farms in the Moldavian region.

RESULTS AND DISCUSSIONS

Estimators calculated for the six traits for studied cows are shown in Table 1.

For the age at first calving were taken data from 667 cows, that have had a minimum of 527 days and a maximum of 1452 days. The mean of values varied between 731.8 ± 10.397 days in farm 4 and 868.49 ± 14.261 days in farm 5. Data are lower compared to data presented by ICAR (960 days) [14]. The coefficient of variation ranged between 5.50% (minimum) and 13.54% (maximum) indicating that populations are homogeneous for this trait.

The milk yield from the six farms ranged between 7304.86 ± 191.016 kg and 10596.08 ± 122.841 kg with a minimum limit of 4004.17 kg and the maximum limit of 15405.42 kg. The coefficient of variation indicates that populations has a medium variability, wich values varies between 12.57% and 21.563%. Compared with the data presented by Bugeac et al. (2012) [2] and Cighi et al. (2009) [3], the obtained average values are higher.

The fat yield for the analyzed populations had a minimum limit of 146.93 kg in farm 5

and a maximum limit of 588.31 kg in farm 6. The averages were between the limits of 312.8 ± 6.529 kg in farm 3 and 406.13 ± 8.904 kg in farm 4. The coefficient of variation indicates very heterogeneous populations.

The protein yield in the studied farms ranged between 237.6 ± 6.388 kg and 337.51 ± 3.773 kg. The coefficient of variation shows medium homogeneous populations ($V\% = 13.081\% - 22.17\%$) with a minimum limit of 127.02 kg in farm 1 and a maximum limit of 479.75 kg in farm 6.

The percentage of milk fat obtained from the studied cows (667) recorded an average of $3.71 \pm 0.027\%$ obtained in farms 2 and 6 and $4.45 \pm 0.056\%$ in farm 1. The averages presented by Bugeac et al. (2012) [2] and Cighi et al. (2009) [3] in their researches on milk production from the Holstein-Friesian breed fall within the limits of this study. After processing statistically data of this trait, populations were medium homogeneous and coefficient of variation ranged between 10.11% (farm 6) and 16.73% (farm 5).

Average for the percentage of protein showed close values, those ranged between $3.23 \pm 0.03\%$ and $3.37 \pm 0.034\%$, with a minimum limit of 2.64% and a maximum limit of 4.12%. The coefficient of variation indicates values between the limits of 5.06% and 10.367%, indicating homogeneous populations for the studied trait.

Comparing the obtained data with the data presented in the annual statistics report (2017) of the Holstein-Friesian International Federation [15] (table 2), it can be said that for the milk yield the farms have lower values compared to the first five biggest milk producing countries (USA, Israel, Denmark, Canada and Greece), with the exception of farm 6 that has a greater value of 32 kg than Greece and less than the other four countries.

For the fat and protein yields the coparation shows that values are lower than yields founded in the annual statistics report.

For the percentage of fat, farms 2 and 6 had equal values with Israel and smaller ones with the rest of the countries. Farms 3 and 4 had higher values than Canada, Israel and the US, but lower than Denmark and Greece. Both farms (1 and 5) had the highest values compared to all countries.

Table 1 Estimators established for the studied traits

Farm	n	$\bar{X} \pm s_x$	V%	Minimum	Maximum
Age at first calving					
Farm 1	112	762.42±10.397	14.43	581	1452
Farm 2	248	773.75±4.057	8.26	652	1077
Farm 3	73	821.67±10.205	10.61	527	1167
Farm 4	15	731.8±10.397	5.50	696	822
Farm 5	68	868.49±14.261	13.54	667	1416
Farm 6	161	734.22±7.165	12.38	607	1243
Milk yield (kg)					
Farm 1	112	8070.2±153.833	20.17	4004.17	11988.35
Farm 2	248	10111.85±102.294	15.93	6115.73	14871.23
Farm 3	73	7961.48±151.809	16.29	4738.05	11119.23
Farm 4	15	10403.87±337.665	12.57	7504.54	12894.28
Farm 5	68	7304.86±191.016	21.56	4142.09	11315.18
Farm 6	161	10596.08±122.841	14.71	6076.04	15405.42
Fat percentage (%)					
Farm 1	112	4.45±0.056	13.29	3.01	6.06
Farm 2	248	3.71±0.027	11.65	2.46	5.2
Farm 3	73	3.96±0.072	15.44	2.66	5.8
Farm 4	15	3.95±0.126	12.34	3.28	5.33
Farm 5	68	4.41±0.089	16.73	2.7	5.92
Farm 6	161	3.71±0.03	10.11	2.72	5.12
Fat yield (kg)					
Farm 1	112	358.61±7.851	23.17	161.38	562.77
Farm 2	248	373.65±4.061	17.12	231.42	543.58
Farm 3	73	312.8±6.529	17.84	200.12	458.41
Farm 4	15	406.13±8.904	8.50	339.33	469.46
Farm 5	68	322.91±10.944	27.95	146.93	537.74
Farm 6	161	391.39±4.572	14.82	228.83	588.31
Protein percentage (%)					
Farm 1	112	3.21±0.02	6.46	2.47	3.62
Farm 2	248	3.22±0.012	6.03	2.58	3.86
Farm 3	73	3.31±0.028	7.22	2.6	3.75
Farm 4	15	3.21±0.061	7.37	2.73	3.56
Farm 5	68	3.26±0.025	6.44	2.79	3.99
Farm 6	161	3.19±0.014	5.74	1.96	3.56
Protein yield (kg)					
Farm 1	112	257.84±4.814	19.76	127.02	387.84
Farm 2	248	324.45±3.239	15.72	189.78	474.85
Farm 3	73	263.6±5.41	17.53	138.13	382.84
Farm 4	15	333.72±11.271	13.08	263.54	417.18
Farm 5	68	237.6±6.388	22.17	127.61	354.52
Farm 6	161	337.51±3.773	14.19	197.67	479.75

For the percentage of protein, all farms had higher values than the US. Farm 2 had the same value as Canada. And Denmark, Israel and Greece had higher values than the all six studied farms.

Compared to ICAR's data on milk yields from cattle in Romania, it was observed that:

the yield of milk, fat and protein is lower than those obtained after statistical processing. For the percentage of fat, the value lies between the lower and upper limit of the obtained averages. And for the percentage of protein the value presented by ICAR is higher than obtained values.

Table 2 Data regarding the milk production traits for Holstein-Friesian breed in six countries

Country	Milk kg	Fat %	Fat kg	Protein %	Protein kg
USA	12447	3.78	470	3.08	383
Israel	11700	3.71	435	3.32	389
Denmark	11053	4.05	444	3.44	377
Canada	10756	3.93	420	3.22	345
Greece	10564	4.08	431	3.32	351
Romania	7039	3.90	275	3.51	247

CONCLUSIONS

Before starting an improvement program on a specific population, it is important to describe it as it is at the beginning of the study. The description refers to the statistical presentation of the phenotypic manifestations (average, standard deviations of the mean, coefficient of variation, minimum and maximum limits) and knowledge of the genetic parameters specific to the studied population (heritability coefficient, repeatability coefficient and correlations among the traits).

Following the analysis of the statistical processing of the six farms in the Moldovian region, it can be concluded that we have homogeneous populations for the percentage of protein, average homogeneous populations for age at first calving, milk yield, percentage of fat and protein yield and, highly heterogeneous populations for the fat percentage.

Comparing the obtained values for milk, fat and protein yields and fat and protein percentages with the values of the five countries was observed that the values that refers to the quantity of milk are lower but for fat and protein percentages values can be improved in some farms and maintained in another ones.

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