

STUDY REGARDING THE IMPROVEMENT OF MILK PRODUCTION ACCORDING TO THE SIRES VALUES

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Abstract

The research proposed to evaluate the influence of the seminal material on milk production. Also was studied seminal material from different countries in order to determinate if the origin influence as well, genotype - environment correlation. The study was carried out on Holstein cows from Romania and data provided by Holstein Ro association. For sires values were consulted international website, recognized worldwide, like dairybulls.com, where the data are published by CDCB (Council on Dairy Cattle Breeding) or INTERBULL. The cows that took part at the research were all at their first lactation, from farms located throughout Romania. After establishing the groups of contemporaries, the real production achieved on standard lactation was compared with the surplus amount of milk due to the sire's values, in order to see if the expected result was achieved. For avoiding error conclusions were compared cows from the same farm, same sire, in that working hypothesis the feeding influence is removed.

Key words: dairy cows, Holstein, milk production, Romania.

INTRODUCTION

Nowadays, at national level, milk, together with dairy products, constitutes a range of products highly appreciated by consumers. This deed arises as a result of the fact that the milk has exceptional nutritional values and contains: all the essential amino acids, 5 types of protein, fat acids, 4 types of lactose, mineral elements and enzymes.

The national milk production is ensured by the animals exploited in individual households, but only in a very small extent and most part of the milk requirement being provided by intensive industrial farms. However, ensuring the national needs varies from one season to another or from one year to another. This happens as a result of the lack of a long-term strategy regarding dairy cows in Romania, of the political conflicts in the neighborhood and because of imports, which in certain conditions for processors represent more advantageous solutions than purchasing milk from Romanian farmers. In our country the farmers have only one option left, to improve their milk production, to improve their herd in order to produce a larger amount of milk with the same herd under the same technological conditions.

There are of course many methods by which the breeder can improve milk production, however to use imported semen from the most valuable contemporary bulls represents the best and fastest solution. Normally, dairy farmers select bulls that will increase the profitability of the exploitation (Schneeberger et al., 1982; Allaire & Thraen, 1985; Rogers, 1990; Tozer & Stokes, 2001).

If in the past there were certain impediments regarding the artificial insemination (the possibility to import top quality semen, the reduced number of operators, the possibilities of storing the material, reticence of farmers regarding this procedure and of course the costs). In the present, things have changed farmers choose artificial insemination, globalization allows the import of semen from anywhere in the world, at any time, and problems related to operators and stored can no longer be discussed. The only debatable aspect therefore remains the price of the doses of semen. The price of a dose can start from a few euros and increases substantially for doses from top bulls, which show superior characters, and if we are also talking about sexed material, the costs are very high. Following these presented aspects, of course, the question arises as to why

farmers should still choose for something like this. The answer is simple, it facilitates the improvement of the livestock in the fastest way, with the help of a dose of sexed material, coming from such a bull, you can get a cow with a higher milk production than the farm average, in a time interval of only 3 years. In other conditions this fact would require a much longer time (native bulls do not have as high a breeding value, 50% chance of getting a female). In the same time inbreeding is avoided, in dairy cattle this has direct and indirect economic consequences for a dairy producer, such as reduced milk and milk component yields, lower reproduction rates, and reduced survival of offspring, (Wiggans et al., 1995; Thompson et al., 2000).

The aim of this paper is to analyze if, in fact, the milk production of the daughters takes place according to the values of the sires.

MATERIALS AND METHODS

The data that are the basis for the realization of this study come from Holstein Breeding Association (ACV Holstein Ro), official control production (COP) and herdbook.

In sight of the present study three farms from Romania were selected, all raising Holstein cows, only cows at the first lactation were selected in the research.

Furthermore, their sire was identified, and of course it's value of improvement on milk production. Regarding the recorded milk production of the cows, the standard lactation (305 days) was used.

Further, by comparing the production of the cows taken in study with the average milk production of contemporaries and with the average of the dams first lactation the objective is analyzed.

In the same time correlating the milk values of the sires with their daughters milk productions we can observe a trend.

The correlation formula is:

$$r(x, y) = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sqrt{\sum(x - \bar{x})^2 \sum(y - \bar{y})^2}}$$

\bar{x} - the mean of the first sample;

\bar{y} - the mean of the second sample.

Before that, since the values of the sires are expressed in pounds (lbs), they have been converted into kilograms (kg), to be expressed in the same unit of measure as the cows milk production.

In order to establish if are significative differences between daughters – mothers production T-Test (Student's T-Test) was used. T-Test formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

RESULTS AND DISCUSSIONS

In order to prepare the study, 3 farms from the territory of Romania were selected (east, south and west). Afterwards, 3 sires from each farm were analyzed, sires from different countries of origin were chosen (from U.S.A., Netherlands, Canada and Italy), in order to see if there are significant differences through the lens of the genotype-environment relationship (Granaci et al., 2021).

Initially, the results of the analysis of the first farm, located in the east of the country, will be presented (Table 1)

Table 1. Analysis of daughters production in farm A

Specification	Milk quantity (kg)
Contemporaries average L305	12225
Milktime daughters - average L305	13025
Milktime - Milk value	1244
Dam 1st lactation average	10728
Difference Milktime daugh. - contemp.	800*
Difference Milktime daugh. - dam 1st lactation	2297
Frazzled daughters - average L305	13010
Frazzled - Milk value	652
Dam 1st lactation average	11939
Difference Frazzled daugh. - contemp.	785
Difference Frazzled daugh. - Dam 1st lactation	1071***
Jedi daughters - average L305	14005
Jedi - Milk value	933
Dam 1st lactation average	11922
Difference Jedi daugh. - contemp.	1780
Difference Jedi daugh. - dam 1st lactation	2083***

Farm A, like all the farms that are part of this work, use the intensive growing system. They place great emphasis on genetics, continuously importing genetic material of the highest quality.

First sire analyzed is *Milktime*, originally from Canada, with identification number - CA 12609045.

STE ODILE MILKTIME

Interbull ID: CANM000012609045
NAAB: 200HO10904

Production Traits [CDCB 12/2022]: G

% Rel.	Milk Lbs.	% Fat	Fat Lbs.	% Prot.	Prot. Lbs.
99	2765	0.14	64	-0.03	76

Figure 1. Milktime - milk value
(source: <http://www.dairybulls.com>)

As can be observed in Figure 1, the bull Milktime has a milk value of 2765 lbs, approximate 1244 kg. Milktime's daughters, from farm A, in the first lactation recorded a mean of 13035 kg of milk on standard lactation. Compared to the average of contemporaries which is 12225 kg, we notice a difference of 800 kg of milk, a difference that cannot be overlooked. We also followed the production of mothers during their first lactation, to highlight whether there have been significant changes on this line as well. We note the fact that the mothers had an average of 10728 kg during the first lactation, in this case, the difference between the production of milktime's daughters and their mothers is 2297 kg of milk. After applying the T-test, the result obtained is $p = 3.8204^*$, there are significant differences between daughters - mothers production.

MELARRY JOSUPER FRAZZLED

Interbull ID: USAM000074261651
NAAB: 007HO12788

Production Traits [CDCB 12/2022]: G

% Rel.	Milk Lbs.	% Fat	Fat Lbs.	% Prot.	Prot. Lbs.	NMS	FMS	CMS	GMS
99	1448	0.03	64	-0.03	36	729	748	736	574

Figure 2. Milktime - milk value
(source: <http://www.dairybulls.com>)

The second bull studied in farm A is called *Frazzled*, it's coming from U.S.A. with identification number - US74261651 and has a

milk value of 1448 lbs/652 kg (Figure 2). Frazzled's daughters recorded an average of 13010 kg of milk on their first standard lactation, with 785 kg more compared with the contemporaries average. Their dams, at their first lactation had an average of 11939 kg of milk (a very good one), however Frazzled daughters obtained with 1071 kg of milk more. The differences are very significant, $p = 4.2081^{***}$.

S-S-I MONTROSS JEDI-ET

Interbull ID: 840M003123886035
NAAB: 007HO13250

Production Traits [CDCB 12/2022]: G

% Rel.	Milk Lbs.	% Fat	Fat Lbs.	% Prot.	Prot. Lbs.	NMS	FMS
99	2073	0.20	18	0.00	65	605	586

Figure 3. Jedi - milk value
(source: <http://www.dairybulls.com>)

The last bull studied in Farm A it's *Jedi*, it has a milk value of 2073 lbs/933 kg (Figure 3). Originally from U.S.A., with identification number US 3123886035, it currently registers a number of 36386 daughters, 64% of them in U.S.A.

In farm A, Jedi's daughters, at their first lactation recorded an average of 14005 kg of milk on standard lactation. Their mothers, during the first lactation as well had an average of 11922 kg. Thus, we find a milk production higher by 2083 kg of milk at the level of Jedi's daughters.

It is also interesting that the mothers of the daughters of the previous bull, Frazzled, registered a similar value 11939, but the Frazzled's daughters are not at same level. We thus deduce the fact that the extra milk recorded at Jedi's daughters is mainly due to the value of the bull, which is higher than Frazzled's (the daughters benefiting from the same conditions in the rest, being in the same farm). In the same time the result of the T-student is similar with the previously one, $p = 3.9064^{***}$, the differences are very significant. All cows that are daughters of the bulls studied recorded very good results, exceeding the average of their contemporaries, their productions being considered good even worldwide.

In the second table are presented the results from the farm located in the south of the country (farm B). If in the first one the bulls were from U.S.A. and Canada, in the second one the bulls were analyzed from U.S.A. and Netherlands.

The first bull studied in this farm is *Altareserve*, originally from U.S.A. has a milk value of 1377 lbs/798 kg with the identification number US 3129340935 (Figure 4).

WELCOME ALTARESERVE-

Interbull ID: 840M003129340935
NAAB: 011HO12033

Production Traits [CDCB 12/2022]: G							
% Rel.	Milk Lbs.	% Fat	Fat Lbs.	% Prot.	Prot. Lbs.	NMS	FMS
98	1377	0.15	9	0.01	47	503	474

Figure 4. Altareserve - milk value
(source: <http://www.dairybulls.com>)

It's daughters, recorded at their first lactation in the farm B an average of 12131 kg of milk in 305 days of lactation (Table 2).

Table 2. Analysis of daughters production in farm B

Specification	Milk quantity (kg)
Contemporaries average (L305)	11333
Altareserve daughters - average L305	12131
Altareserve - milk value	620
Dam 1st lactation average	10458
Difference Altareserve daugh. - contemp.	798
Difference Altareserve daugh. - dam 1st lactation	1673**
Altarevis daughters - average L305	12224
Altarevis - milk value	911
Dam 1st lactation average	10061
Difference Altarevis daugh. - contemp.	891
Difference Altarevis daugh. - Dam 1st lactation	2163***
Altashockwave daughters - average L305	11988
Altashockwave - milk value	447
Dam 1st lactation average	10923
Difference Altashockwave daugh. - contemp.	655
Difference Altashockwave daugh. - dam 1st lactation	1065 ^{NS}

The contemporaries of *Altareserve*'s daughters recorded an average of 11333 kg, 798 kg less compared to the production of its daughters. A good production was also obtained by mothers, 10458 kg of milk on standard lactation, however the daughters surpassing them with 1673 kg. In this case, $p = 2.9882^{**}$, distinctly significant differences being noted.

Further, the second bull studied in farm B it's *Altarevis*. Coming for U.S.A. with the identification number US 3131664122 and having a milk value of 2025 lbs/911 kg (Figure 5).

PEAK ALTAREVIS-ET

Interbull ID: 840M003131664122
NAAB: 011HO12000

Production Traits [CDCB 12/2022]: G							
% Rel.	Milk Lbs.	% Fat	Fat Lbs.	% Prot.	Prot. Lbs.	NMS	FMS
98	2025	0.15	32	0.00	63		

Figure 5. Altarevis - milk value
(source: <http://www.dairybulls.com>)

The daughters of this bull realized in average a production of 12224 kg of milk in their first standard lactation. Compared with the productions realized by their contemporaries, we can notice an addition of 891 kg of milk. Even a bigger difference is notice between the daughters of *Altarevis* production and their mothers production, a difference of 2163 kg, the mothers recorded an average of 10061 kg on their first lactation. This difference is proved also by the result of T-test, $p = t = 3.9660^{***}$, very significant differences.

KONING ALTASHOCKWAVE.

Interbull ID: NLDM000943461722
NAAB: 011HO12095

Production Traits [CDCB 12/2022]: G							
% Rel.	Milk Lbs.	% Fat	Fat Lbs.	% Prot.	Prot. Lbs.	NMS	FMS
98	994	0.01	36	0.00	30	602	601

Figure 6. Altashockwave - milk value
(source: <http://www.dairybulls.com>)

Altashockwave is the last bull studied from the farm B. It's originally from Netherlands, having the identification number NL 943461722 and milk value equal with 994 lbs/447 kg (Figure 6). Having the lowest value of

milk among the bulls from farm B, this is also reflected in the production of daughters, 11988 kg of milk, lowest compared with the production of Altareserve or Altarevis daughters. This fact does not mean that its daughters did not perform, on the contrary, the daughters produced 655 kg of milk more compared with their contemporaries and with 1065 kg ok milk more compared with their mothers. However, $p = 1.8236^{NS}$, with others words, the differences are not significant in this case. In other words, they performed, but in correlation with the value of the sire, more above the farm average, but under the daughters of more valuable bulls. The last farm that took part to the study, farm C, located in the west of the country propose for the study two bulls coming from Italy and one from Netherlands (Table 3).

Table 3. Analysis of daughters production in farm C

Specification	Milk quantity (kg)
Contemporaries average (L305)	11831
Van Halen daughters	12623
Van Halen - milk value	471
Dam 1st lactation average	6310
Difference Van Halen daugh. - contemp	792
Difference Van Halen daugh. - dam's 1st lactation	6313***
Fusion daughters	13115
Fusion - milk value	693
Dam 1st lactation average	8528
Fusion's daugh. - contemp.	1284
Diff Fusion daugh– dam 1st lactation	4587***
Sound system daughters	12565
Sound system - milk value	581
Dam's 1st lactation average	8065
Difference Sound system's daugh. - contemp.	734
Difference Sound system's daug. - dam's 1st lactation	4500***

GARIONI ROYAL VANHALEN

Interbull ID: ITAM019991363560
NAAB: 543HO00067

Production Traits [CDCB 12/2022]: G									
% Rel.	Milk Lbs.	% Fat	Fat Lbs.	% Prot.	Prot. Lbs.	NMS	FMS	CI	
94	1046	0.03	48	0.02	38	391	357	3	

Figure 7. Van Halen - milk value
(source: <http://www.dairybulls.com>)

In the beginning, we will present the information regarding the bull named *Van Halen*. Originally from Italy, with identification number IT 19991363560 and a milk value of 1046 lbs/471 kg (Figure 7). We note the fact that in farm C, the daughters of Van Halen recorded a mean of milk productions of 12623 kg, 792 kg more than the mean of their contemporaries which was 11831 kg. Remarkable is the big difference between the production of Van Halen's daughters and their mothers. The differences are very significant, $p = 12.3586^{***}$, Van Halen's daughters recorded a double production, 6310 kg of milk being the mean of the mothers production.

KOEPON FUSION

Interbull ID: NLDM000751090271
NAAB: 198HO02092

Production Traits [CDCB 12/2022]: G						
% Rel.	Milk Lbs.	% Fat	Fat Lbs.	% Prot.	Prot. Lbs.	CI
90	1540	0.02	52	-0.04	37	

Figure 8. Fusion - milk value
(source: <http://www.dairybulls.com>)

The second bull is a Dutch one, named *Fusion* having the identification number NL 751090271 and a milk value of 1540 lbs / 693 kg. It's milk value reflects at its daughters production, 13115 kg of milk in average, compared with contemporaries production we notice a plus of 1284 kg of milk. A big difference is noticed also between Fusion's daughters and their mothers production (8528 kg), 4587 kg of milk in the favor of the descendants, $p = 5.4165^{***}$, so very significant differences.

MIRABELL SOUND SYSTEM

Interbull ID: ITAM017991512628
NAAB: 543HO00066

Production Traits [CDCB 12/2022]: G									
% Rel.	Milk Lbs.	% Fat	Fat Lbs.	% Prot.	Prot. Lbs.	NMS	FMS	CI	
94	1291	0.11	81	0.02	46	563	528		

Figure 9. Sound System - milk value
(source: <http://www.dairybulls.com>)

The last bull that took part to the study is an Italian one, named Sound System, having a

milk value of 1291 lbs/581 kg, being identify by IT 17991512628 (Figure 9). Sound system daughters recorded at their first lactation an average of 12565 kg of milk, with 734 kg above the contemporaries average. Compared with their mothers production, these recorded 4500 kg of milk more (the mothers average production at first lactation being 8065 kg of milk), $p = 5.3390^{***}$, again same result obtain, very significant differences being noticed.

We conclude as in the case of the third farm the value of improving milk production, due to the sires, turns in real production in the milking room.

As previously mentioned, correlations between the bulls milk value and their daughters milk production were also made for each farm. For the first farm, the result of correlation, r is equal with -0.02 , in other words, non-existent correlation (Figure 10).

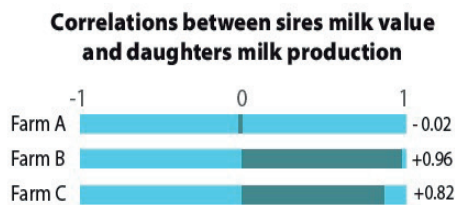


Figure 10. Correlation results

At the second farm, r is equal with $+0.96$, almost 1 (maximum value). This result is telling us that the correlation is very high, being a very close relationship between the variables. Similar result is recorded at farm C, $r=0.82$, again showing a very high correlation between the sire milk value and their daughters milk production.

CONCLUSIONS

The use of semen from world-class bulls represents the best method of improving milk production at the national level at the moment. In this study it was found that the daughters of such bulls will produce a higher amount of milk compared to their contemporaries. Also compared to the mothers productions,

impressive results are noted, there are cases where the production effectively doubled. The results from T-test proved (except one single case) that the differences are significant and very significant regarding the milk production of daughters – mothers.

Regardless of the origin of the sires (U.S.A., Netherlands, Italy or Canada) the results were positive.

Based on the results obtained from the correlations, except for farm A where the result is 0 (the production of cows in this farm being balanced) we deduce the fact that between sire milk value and daughter milk production exist a positive and highly relationship.

ACKNOWLEDGEMENTS

This present study was supported by Holstein RO Breeding Association (ACV Holstein Ro).

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