

# THE CORELATION BETWEEN CONFORMATION TRAITS AND MILK PRODUCTION AT HOLSTEIN COWS

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## Abstract

*The objective of this research was to evaluate the correlation between the conformation traits and milk production at Holstein cows in Romania. It is well known the fact that milk production is influenced by many factors like: management, genetics, nutrition, season etc. But this study wants to reveal if the milk production is correlated with the conformation traits and how they influence it. In the study were taken farms from three different areas of Romania, East, South and West, also were analyzed farms of different size (small, medium and big). The animals that took part at the study were at first, second or third lactation. For all the cows were appreciated a number of 22 characters, characters that are separated in five different groups: dairy capacity, dairy character, rump, feet & legs and mammary. All the classified animals were between 20-120 days in lactation. To avoid possible inconclusive conclusion, in the study were compared cows from same area, farm dimension and number of lactation.*

**Key words:** conformation traits, dairy cow, milk production.

## INTRODUCTION

The milk production is an important branch of agriculture in many countries and also in Romania. Milk and dairy products have a share of approximately 30,9% of the net daily consumption of a resident of Romania, so the biggest part from animals products (INS, 2019). In 2019, the processing units collected 1.125.300 tons of milk from national farms. That amount was not enough, in the same year being imported 128.138 tons of milk (INS, 2020).

Under this conditions, an increase of cattle effective was expected, but the opposite happened. The data from National Institute of Statistics indicate that at 1 June 2020, the number of cattle decreased with 2.4% from the total number and with 1.7% of reproductive heards. The reasons can be numerous: the lack of workforce, exploitation of unproductive animals, unsatisfactory grants, high production costs and many more. However, solutions must be found. The production efficiency of cows is closely related to milk yield in successive lactations and longevity (Sawa et al., 2013)

The factors that may influence milk production must be analyzed. In that way, the farmers can eliminate, or reduce the factors that negatively influence it and exploit the animals as profitably as possible.

In the same time, the factors that can influence the milk production must be studied in the order to improve it. The milk production is influenced by so many factors (genetics, nutrition, management, climate, etc.). Some of them can be controlled easy, others more difficult and with great financial efforts. In addition to these factors we bring in the study another factor that can influence the milk production – the conformation traits. These traits appear earlier in life and may allow for faster selection of prolific animals (Małgorzata & Zarnecki, 2012, Madrid et al., 2014). The tool that helps us to have an overview of the herd that we are working with is the type classification action (Pașcu et al., 2018).

If at the first sight the conformation traits have nothing to do with the milk production, in reality things may be different.

Therefore, in order to put into evidence the correlation between the conformation traits and

milk production at Holstein cows, the paper present an analysis of the cows whose conformation traits were analyzed and their milk production.

## MATERIALS AND METHODS

The target of the paper is to conduct a study on the correlation between the conformation traits and milk production at cows. Conformation traits have been proposed as indirect indicators for the improvement of productive and sanitarian parameters (Madrid et al., 2014). In order to elaborate the study were classified cows, by conformation traits, from nine different farms, farms located in East, South and West of the country. All the cows classified were Holstein breed.

For the cows classified were appreciated five groups of characters. The first group is *Dairy capacity*, including the traits: stature, body depth and chest width. The second group is *Dairy character*, where is appreciated the angularity of the animal. *Rump* is the third group, including the characters: rump angle, rump width and loin strength. The fourth group is *Feet & Legs* and presents the following traits: foot angle, rear legs - side view, rear legs - rear view, bone quality and locomotion. The last group is represented by *Mammary*, with the traits: fore udder attachment, rear udder height, rear udder width, suspensory ligament, udder depth, front teat placement, rear teat placement, teat length, udder texture and udder tilt.

After all the traits is appreciated the animals receive a final score (Figure 1), these being ranked as follows:

- Score between 50-64 points - unsatisfactory;
- Score between 65-74 points - satisfactory;
- Score between 75-79 points - good;
- Score between 80-84 points - good plus;
- Score between 84-89 points - very good.

The final score is calculated based on the group score. Dairy capacity represents 10% from final score, dairy character 10%, rump also is 10, feet & legs 30% and mammary 40%.

In order to highlight the correlation between the conformation traits and milk production, in the study were compared the final scores obtained by animals after classification with the standard lactation.



Figure 1. Cow classified as very good

The data collected from the classifier activity at HolsteinRo association have been interpreted and statistically processed building in this way the trend line.

## RESULTS AND DISCUSSIONS

For the study were classified a number of 105 cows, at first, second and third lactation. All of them in the period September - November 2019. The appreciation took place when the animals were between 20-120 days in lactation. In the small farms were classified 5 cows in each farm, 10 cows in medium farms and 20 in the big farms. Next year, in 2020, the cows were weaned and standard lactation was estimate in order to make a correlation between the score obtained for conformation traits and the quantity of milk produced.

In the first phase we will present the results from the small farms.

Table 1. Small farm from South of Romania

	Conformation Score	L305 (kg)
Cow1	65	5336
Cow2	69	6044
Cow3	73	6144
Cow4	73	6152
Cow5	75	6632
X + Sx	71 ± 1.79	6061.6 ± 208.78
S	4	465.60
V%	5.63	7.68

In this farm it's easily to observe the fact that the standard lactation is bigger as the score is higher (Figure 2). For cow 1, classified as -

satisfactory the lactation was only 5336 kg. Meanwhile, cow 5 scored with 75 points, ranked - good the milk production was 6632. For cows 3 and 4, appreciated with 73 points, the lactation was almost the same 6144 respectively 6152. The average for the conformation score is 71 points, with an average error of 1.79 points. The average for the milk production it's only 6.061 kg.

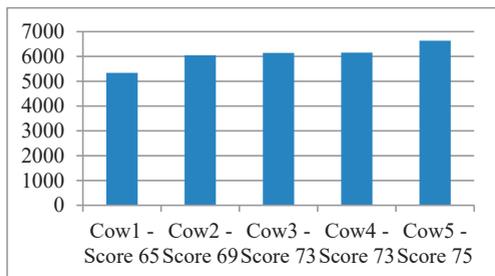


Figure 2. The dynamics of milk production in relation with the conformation score (small farm - South area)

Table 2. Small farm from East of Romania

	Conformation Score	L305 (kg)
Cow1	72	7092
Cow2	74	7235
Cow3	74	7572
Cow4	78	8116
Cow5	79	8571
X + Sx	75.4 ± 1.33	7717.2 ± 277.56
S	2.97	618.97
V%	3.93	8.02

In Table 2, we can see that the average for conformation score was higher than in Table 1, being 75.4 points. Correlated with that we have the average for milk production equal with 7717 kg.

The farm located in the East area (Figure 3) presents better conformation scores that the one from the South and also bigger milk production. Cow number 5, scored 79 points, ranked - good, produced 8571 kg of milk on standard lactation. The difference between the cow1, with 7092 kg and cow 5 with 8571 kg is approximate 1.500 kg and 7 points at conformation score, for the cow 5. Cow 4, classified also as - good, but with 78 points produced 8116 kg, not significantly differences from cow 5 (Figure 4).

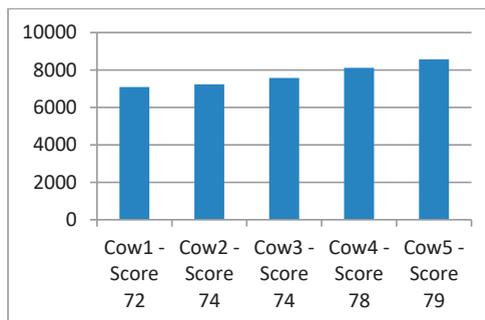


Figure 3. The dynamics of milk production in relation with the conformation score (small farm - East area)

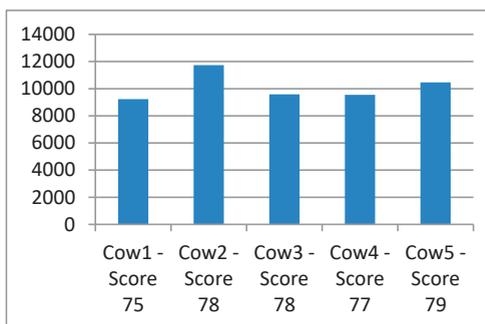


Figure 4. The dynamics of milk production in relation with the conformation score (small farm - East area)

In the third small farm are not significant differences in the conformation scores obtained, all cows belonging to the class - good. The lowest score was obtained by the cow 1-75 points and the biggest by the cow 5-79 points. However, at milk production the biggest difference was registered between cow 1 and cow 2, with 9228 kg, respectively 11737 kg. Cow 3, appreciated also with 78 points produced only 9584 kg of milk in standard lactation. But of course, how we mentioned before, all the cows from this farm are in the same class of conformation traits. Therefore, it's difficult to elaborate a conclusion extrapolating from this farm.

The farm from the West of Romania has the biggest average for conformation score by all small farms, 77.4 points (Table 3).

All the animals that took part to the study from the small farms were at their first lactation.

Further, we will present the results from the farms with medium dimension. We make the mention that in this type of farms the animals studied were at second lactation. The average for the milk production it's also the highest, 10111 kg (Figure 5).

Table 3. Small farm from West of Romania

	Conformation Score	L305 (kg)
Cow1	75	9228
Cow2	78	11737
Cow3	78	9584
Cow4	77	9544
Cow5	79	10463
X + Sx	77.4 ± 0.68	10111.2 ± 456.58
S	1.52	1018.17
V%	1.96	10.07

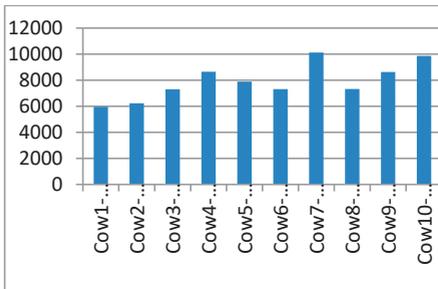


Figure 5. The dynamics of milk production in relation with the conformation score (medium farm - South area)

The lowest conformation score in this farm it's obtained by cow 1, 60 points, ranked – unsatisfactory. The milk production obtained by this cow it's only 5962 kg. At the other pole, we find cow 7, ranked as - good plus, with 80 points. The cow 7 recorded 10116 kg milk production per lactation. The animals 5 and 9, scored the same, with 69 points registered 7891 kg milk, respectively 8630, a difference of 739 kg. All the results can be seen in the Table 4.

Table 4. Medium farm from South of Romania

	Conformation Score	L305 (kg)
Cow1	60	5962
Cow2	64	6227
Cow3	65	7308
Cow4	75	8644
Cow5	69	7891
Cow6	68	7310
Cow7	80	10116
Cow8	67	7324
Cow9	69	8630
Cow10	75	9861
X+Sx	69.2 ± 1,88	7927.3 ±440.27
S	5.96	1391.26
V%	8.61	17.55

In the first medium farm, we have an average by only 69.2 points for conformation score. Correlated with an average by 7927 kg for milk production, but with a standard deviation pretty big. Also, we have a coefficient of variation big, 8.61%.

Two other cows are classified the same, cow 4 and 10, the first one produced 8644 kg of milk, the second one 9861.

As a summary, in this farm the situation is: two cows ranked unsatisfactory, with an average of 6094 kg milk production, five cows ranked as satisfactory, with an average of 7692 kg of milk, two cows ranked as good with an average of 9252 kg of milk and one cow ranked as good plus with a production of 10116 kg of milk.

It's obviously the fact that the biggest production was obtained by cow 3, scored 81 points, on the second place, after lactation it's cow 4, scored 79 and after that cow 8 also with 81 points (Figure 6).

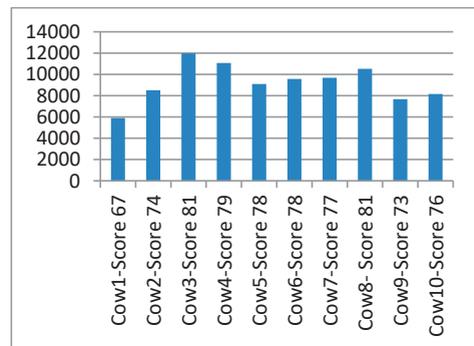


Figure 6. The dynamics of milk production in relation with the conformation score (medium farm - East area)

In the medium farm, from the East of Romania, we have three cows ranked as satisfactory, with an average of 7362 kg of milk, five cows with an average of 9519 kg of milk and two cows with an average of 11245 kg of milk (Table 5). The average for the conformation score is 76.4, a pretty good one. The milk production presents an average by 9217 kg, also a good one. The last medium sized farm is from the West of the country. In this farm we identified a cow ranked as very good, cow 4. This cow produced on the standard lactation a quantity of 9066 kg of milk. The animals 1 and 9, scored with 70 points have the smallest production 5519, respectively 6268 kg of milk. At cow5 and cow10, ranked as satisfactory, with 73 points we

recorded a similar lactation 7256 kg and 7795 kg of milk. All the results are available in the Figure 7.

Table 5. Medium farm from East of Romania

	Conformation Score	L305 (kg)
Cow1	67	5902
Cow2	74	8508
Cow3	81	11973
Cow4	79	11072
Cow5	78	9102
Cow6	78	9578
Cow7	77	9687
Cow8	81	10517
Cow9	73	7677
Cow10	76	8156
X+Sx	76.4 ± 1.33	9217.2 ± 558.97
S	4.22	1766.36
V%	5.53	19.16

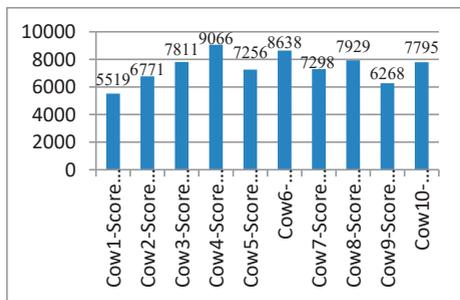


Figure 7. The dynamics of milk production in relation with the conformation score (medium farm - West area)

The last type of farms studied are the big farms, at their level we appreciated cows at third lactation. In the Figure 8 can be observed the data obtained from the farm located in the South area.

If so far the biggest milk production was obtained by the cow with the higher score, in this case things are different. Cow 9, scored 78 points has a production of 14043 kg. Cow 19, ranked as - good plus, with 81 points has a production of 13150, the second from the group. According to the distributions on conformation classes we have the next situation:

- 6 cows ranked - satisfactory, with an average of 8948 kg;
- 13 cows ranked - good, with an average of 11088 kg;
- 1 cow ranked - good plus with a production of 13150 kg.

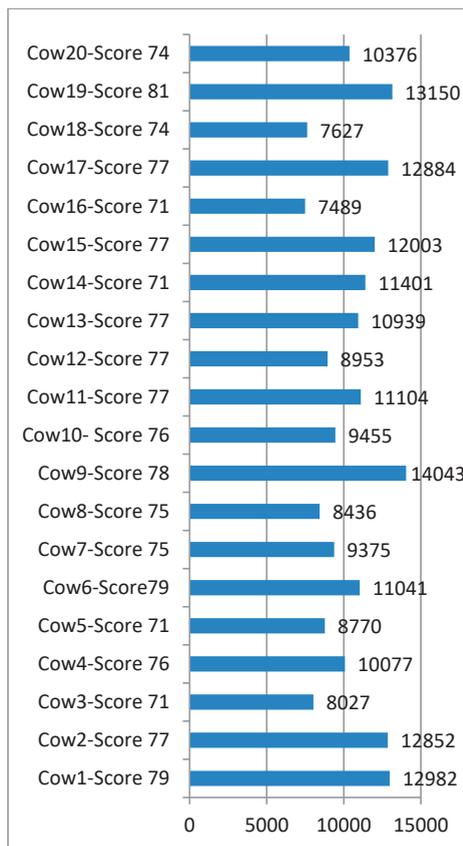


Figure 8. The dynamics of milk production in relation with the conformation score (big farm - West area)

Figure 9 presents the results from the big farm from the East of the country.

The lowest production was obtained by cow 12, only 7180 kg, cow 8 scored also with 72 points produced 10404 kg of milk.

Cow 10, ranked - very good, with 88 points produced 16123 kg, in time that cow 4 also with 88 points produced 14890 kg of milk.

The last farm presents a situation more balanced, there are no big differences between the scores obtained and the milk produced. The cows with the biggest score are 12 and 17, with productions of 8364 and 9656 (Figure 10).

Grouped by class we have 15 cows ranked - good, with an average of 8366 kg and 5 cows ranked as good plus with an average of 9372 kg of milk.

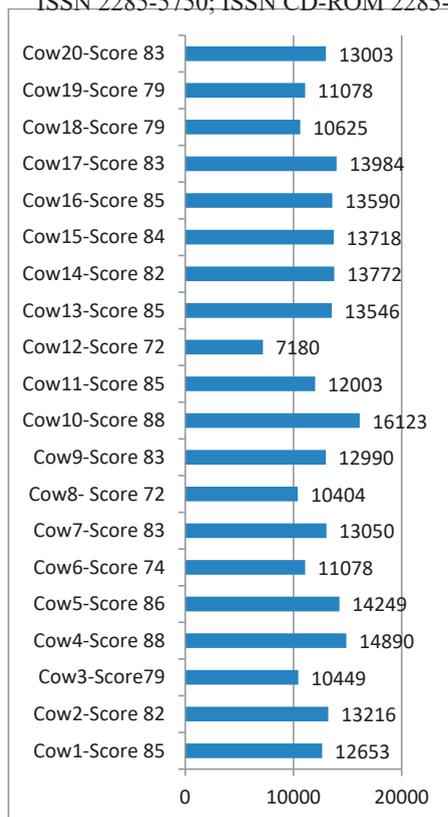


Figure 9. The dynamics of milk production in relation with the conformation score (big farm - East area)

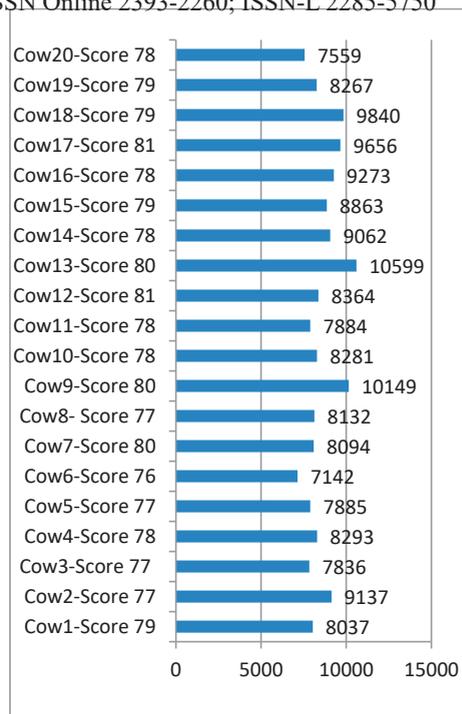


Figure 10. The dynamics of milk production in relation with the conformation score (big farm - West area)

## CONCLUSIONS

The lowest milk production was always obtained by the cows ranked unsatisfactory or satisfactory.

In small and medium - sized farms (where were classified cows at first and second lactation) the biggest production was obtained by the cows with the highest score.

In the big farm (where were classified cows at third lactation) the biggest production was not always obtained by the animal with the highest score.

If we analyze the data in relation conformation class - milk production we observe that in all situation as higher is the class as higher is the production.

Therefore a cow ranked as very good/good plus after the conformation traits will produce more milk that a cow ranked unsatisfactory. We can use conformation traits appreciation when we want to make early reforms.

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