

## RELATION OF MILKING TEMPERAMENT AND MILK YIELD IN HOLSTEIN AND BROWN SWISS COWS

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### Abstract

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The study comprises 118 cows, of which 69 Holstein-Friesian and 49 Brown Swiss ones. The cows from both breeds are reared by the same technology – free with individual cubicles for rest and milking in milking parlour, herringbone type. To assess the temperament a 5-score system is used: 1 – very nervous and 5 – very calm cows. The average score for milking temperament in the Holstein cows is slightly higher than that of the Brown Swiss ones, 3.74 to 3.65, respectively. The cows with a nervous type of temperament, scores 1 and 2, comprise a relatively high percentage, and they are slightly more in the Holstein – 15.9% than in the Brown Swiss cows – 12.2%. The average milking yield of the nervous and very nervous cows is higher than that of the medium to very calm ones. That difference is greater in the Holstein cows – 744.8 kg compared to the Brown Swiss ones - 445.2 kg. The ranking correlation (Spearman) of the breeding bulls for the dairy trait and the percentage of daughters with scores from 3 to 5 and breeding value for milking temperament score is respectively  $r_s = -0.21$  and  $r_s = -0.10$ .

*Key words:* milking temperament, 305 days milk yield, Holstein, Brown Swiss cow

### Introduction

Temperament may be defined as type and degree of reaction of the animal in its overall surrounding conditions (Herve et al., 2007). The temperament of cattle has been of interest since the time of their domestication. For many centuries, natural selection for calmer animals has been conducted (Dickson et al., 1969).

In the past decade a considerable increase of the average size of herds for milk production has been observed in many parts of the world, which necessitates farmers to invest less time in the individual animal. Milking speed and temperament are traits that have major effect on the time needed for servicing the individual animal and therefore they are extremely important in large farms (Jacobsen et al., 2009). In addition,

very nervous and slowly milked cows are exposed to a greater risk of early culling compared to the calm ones and the ones with medium milking speed (Berry et al., 2005; Sewalem et al., 2010). The new traits added to the linear descriptive ones for the dairy cattle are the so-called workability traits – milking speed and milking temperament. 28 member-countries of Interbull control speed and 23 – the milking temperament in the various dairy breeds were checked. In these countries, national genetic evaluations are made for these two traits and they are included in their breeding programs and targets (Bagnato et al., 2007; Jacobsen et al., 2009).

In Bulgaria, a milking temperament evaluation has not been performed so far. There is no information about the bulls used in dairy herds, the quality of their posterity according to that trait.

The objective of the study is to find out the share of animals with various milking temperament and its relation to the milk yield of Holstein and Browns Swiss cows under conditions of the same herd.

## Material and Methods

The study comprises 118 cows, of which 69 Holstein-Friesian and 49 Browns Swiss ones from the cattle farm at the Agricultural Institute Stara Zagora.

Cows from both breeds are reared under the same technology – free in individual cubicles for rest and milking in a milking parlour, herringbone type. After 7-month pregnancy, heifers are placed together with the dry cows. Calving takes place in delivery cubicles where animals stay for a few days and primiparous are trained to be milked.

Reporting of the milking temperament has been made once during lactation and all currently milked cows from both breeds have been evaluated. The authors have made the evaluation during evening milking using information provided by the milkmen, too. To evaluate the temperament a 5-score system is used (at the bottom of the page).

For clearer reporting of some relations grouping of the milking temperament scores is also used, respectively: cows with nervous temperament – including scores 1 and 2 and cows with calm temperament – including scores 3, 4 and 5.

The data about the milk yield have been taken from the official farm control office. For the statistical processing the relevant modules from the STATISTICA 6 package have been used.

To obtain the breeding value estimations of the bulls on the studied traits the BLUP (Best Linear Unbiased Prediction) procedure of LSMLMW software package by Harvey W, 1987 has been used. The estimates have been obtained by using the following model:

$$Y_{ijkl} = \mu + P_i + L_j + e_{ijkl}$$

Where:

$Y_{ijkl}$  is the dependant variable (milk yield for 305-day lactation and milking temperament score);  $\mu$  is the population mean;  $P_i$  is the breed effect,  $L_j$  is the effect of the number of lactation, and  $e_{ijk}$  is the effect of the non-included random factors. In presenting the results the breeding value is used presented as sum of the BLUP score and the mean for the model ( $\mu$ ).

## Results

The average values for the milk yield of the cows from the two breeds are very close and the Holstein cows have slightly higher milk yield for 305 days lactation (Table 1). However, they have lower percentage of fat and protein in milk compared to cows from the Brown Swiss breed, the difference is statistically significant at  $P < 0,001$ . The average milking temperament score for the Holstein cows is slightly higher than that of the Brown Swiss ones, 3.74 to 3.65, respectively.

Figure 1 presents the distribution of cows (in %) according to the milking temperament score. In both breeds rather high is the percentage of very calm cows (score 5), 37.7% in the Holstein and 30.6 % in the Brown Swiss cows, respectively. In the Brown Swiss cows, a rather high percentage – 36.7% - of cows exhibiting restlessness during preparation and milking is

Class	Definition	Description of behaviour
1	Very nervous	Very restless during preparation and milking itself, lift the leg, kick the machine and the milkman, move from one foot to another, slash with the tail, move on the bed (the place in the milking parlour), upon reaching towards them they pull back or react.
2	Nervous	They look very restless during preparation and milking; sometimes kick the machine; move from one foot to another all the time; startle upon reaching an arm to them.
3	Medium	Calm as a whole, but move a lot; they can sometimes lift a leg during preparation and milking, but without kicking; they often slash with the tail or sometimes look restless.
4	Calm	Stand calm on the bedding (the milking place); do not show any restlessness during preparation and milking, but may move frequently; shift their point of gravity from one side onto the other; sometimes slash with the tail; show slight restlessness.
5	Very calm	Never show restlessness; fully calm and obedient during preparation and milking itself; the ideal dairy cow

reported - score 3. In cows from both studied breeds the share of those with score 2 is pretty equal, the difference is in cows with score 1 (very nervous), and in the Brown Swiss ones they are almost half less than the Holstein, 4.1 and 7.5%, respectively.

In cows from both breeds in the studied herd, animals with nervous temperament, score 1 and 2, comprise relatively high percentage, being slightly more in the Holstein – 15.9% compared to the Brown Swiss cows – 12.2% (Figure 2).

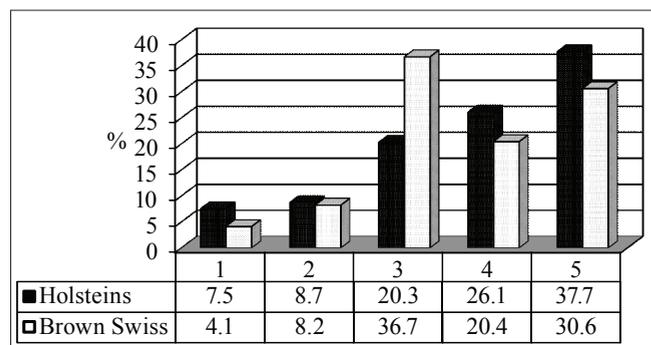
Both breeds and lactations (Table 2) report a difference in the mean milking temperament scores. Average

for both breeds, cows in first lactation have the lowest temperament score – 3.43 and gradual increase in the score is observed with growing in the number of lactations, 3.72 in second and 3.85 in third and further lactations, respectively, the differences being not statistically significant. Breeds report a difference in the average scores of cows by lactations and the tendencies for change of the scores by lactations are not the same.

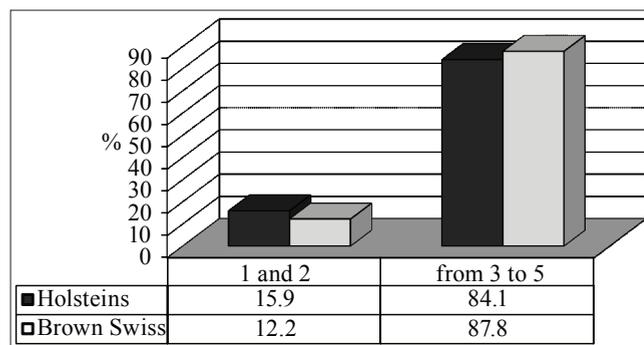
In the Holstein cows, there is no tendency for increase of the milking temperament score with the number of lactation and the differences are not statistically significant. In the Brown Swiss cows clearly expressed is the tendency for increase of the score with increasing the number of lactation and the differences between the average score of cows at I<sup>st</sup> and II<sup>nd</sup> and III<sup>rd</sup> and further lactation are statistically significant at P<0.05 and P<0.01. In cows from the Brown Swiss breed, a difference is observed mainly between the scores at first lactation and the older cows. On Figures 3 and 4 the distribution in percentage of cows is presented depending on the number of lactation and the grouped temperament scores. In the Holstein cows the percentage of animals with nervous milking temperament

**Table 1**  
Average statistical data about cows from both breeds included in the study

Traits	Holstien cows (n=69)	Brown Swiss cows (n=49)
	x ±Sx	x ±Sx
305 days milk yield	6279.8 ± 203.8	6188.8 ± 194.3
Average % of milk fat	3.90 ± 0.04	4.16 ± 0.04
Average % of milk protein	3.29 ± 0.02	3.43 ± 0.01
Average temperament score	3.74 ± 0.14	3.65 ± 0.16



**Fig. 1.** Distribution of the cows (in %) depending of milking temperament estimates by breeds

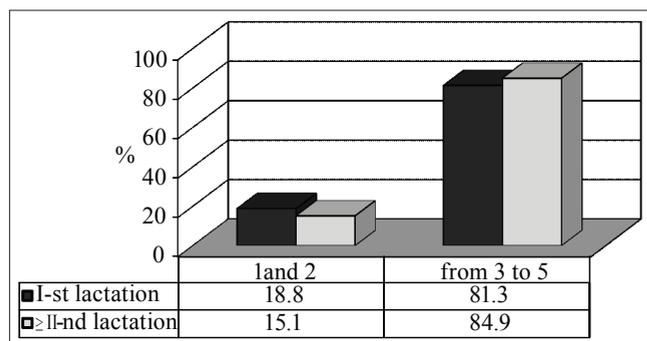


**Fig. 2.** Distribution of the cows (in %) depending of grouped milking temperament estimates by breeds

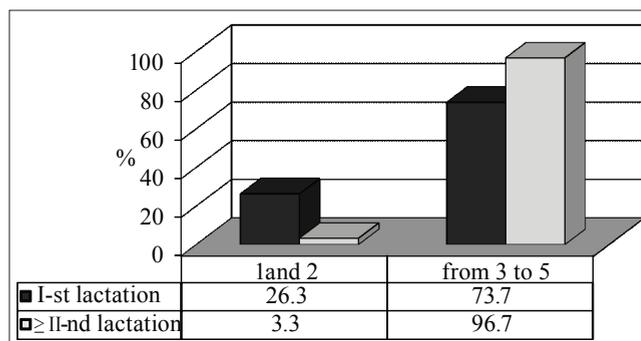
**Table 2**  
Average values of milking temperament scores depending on the number of lactation and breed

Number of lactations	Total for both breeds		Holstein cows		Brown Swiss cows	
	n	x ±Sx	n	x ±Sx	n	x ±Sx
I-st lactation	35	3.43 ± 0.22	16	3.88 ± 0.33	19	3.05 ± 0.27 ab
II-nd lactation	25	3.72 ± 0.22	16	3.56 ± 0.30	9	4.00 ± 0.29 a
≥III-rd lactation	57	3.86 ± 0.14	37	3.76 ± 0.18	21	4.05 ± 0.21 b

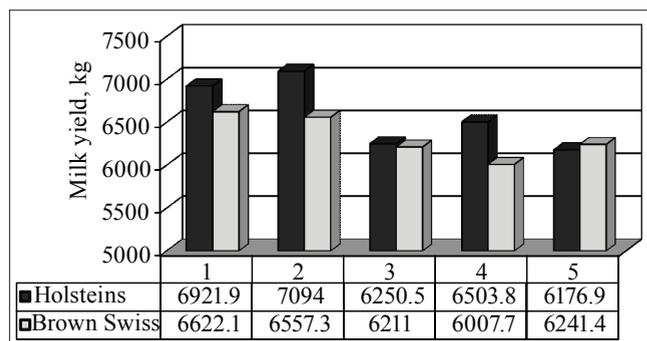
a - P<0.05; b - P<0.01



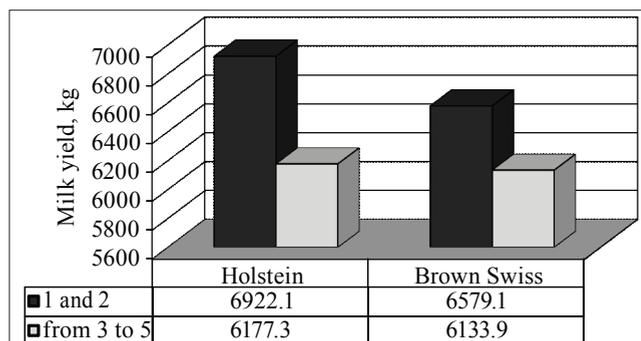
**Fig. 3. Distribution of the Holstein cows depending of grouped milking temperament estimates by lactations**



**Fig. 4. Distribution of the Brown Swiss cows depending of grouped milking temperament estimates by lactations**



**Fig. 5. Mean 305 days milk yield depending of milking temperament estimates by breeds**



**Fig. 6. Mean 305 days milk yield depending of depending on the grouped temperament scores**

(scores 1 and 2) is relatively high both in first and later lactation with slight decrease from 18.8 to 15.1%.

Quite different are things with cows from the Brown Swiss breed, fig. 4. In first lactation very high percentage – 26.35 - is reported for cows with nervous temperament and very low in second and further lactations – only 3.3%. That corresponds to a very high percentage of medium to very calm cows (scores from 3 to 5) in cows on II<sup>nd</sup> and further lactations – 96.7%.

The average milk yield of cows in both breeds according to the temperament score is presented on Figure 5. There is clearly stated tendency in cows from both breeds for higher milk yield of the ones with nervous and very nervous reactions during milking (scores 1 and 2). In cows with scores from 3 to 5 in both breeds a variation of the average milk yield is observed with no specific regularity, but in any case lower than that of the cows with scores 1 and 2.

For clearer reporting of that difference, Figure 6 presents the average milk yield for normal lactation of cows from both breeds depending on the grouped temperament scores. The average milk yield of the nervous and very nervous cows is higher than that of the medium to very calm ones. That difference is greater in the Holstein cows – 744.8 kg, compared to the Brown Swiss ones - 445.2 kg.

In Table 3 the breeding values of bulls with more than 5 daughters in the herd are given. Only bull No. 190740 is Brown Swiss, the other four bulls are Holstein. In the Brown Swiss cows, there is no other bull with more than 5 daughters in the studied herd. Bulls Nos. 2205349 and 228685 have no daughters with scores 1 and 2 in that herd. Their temperament breeding values for the daughters are over 4, for the first one the temperament breeding value is 4.35, which shows that most daughters of the bull are very calm at milk-

**Table 3**  
**Ranking of bulls with more than 5 daughters in the herds by the traits milking temperament and milk yield for 305 days**

No of bull	Daughters with score from 3 to 5		Breeding value for 305 days milk yield		Breeding value for temperament score	
	%	rank	kg	rank	score	rank
5003755	75	4	5811,4	4	3,09	5
2205349	100	1	5935,2	3	4,35	1
228685	100	1	5768,9	5	4,05	2
5003832	83,3	2	6412,2	1	3,47	3
190740	78,3	3	6016,5	2	3,33	4

ing. However, the daughters of these two bulls have relatively low milk yield. The highest is the milk yield of the daughters of bull No. 5003832 followed by No. 190740, but respectively they have greater number of daughters that react nervously and very nervously when milked, 18.7 and 21.7 %, respectively. The worst combination from both traits can be the daughters of bull No. 5003755. Of all daughters from that bull 25%, react nervously and very nervously when milked. The breeding value for temperament evaluation of the daughters is the lowest – 3.09, and the breeding value for milk yield for 305 days lactation is one of the lowest.

The correlation between ranks (Spearman) of the bulls for breeding value for milk yield and the percentage of daughters with scores from 3 to 5 and the breeding value for milking temperament score is  $r_s = -0.21$  and  $r_s = -0.10$ , respectively.

## Discussion

The average milking temperament scores of cows from both breeds in the studied herd have mean values 3.74 and 3.65, respectively. That defines animals as medium calm. Abe et al. (2002) evaluate the milking temperament of Holstein cows in Japan and the scale they use is reverse to the one used in most countries and by us, respectively: 1 – very calm and 5 – very nervous cow. The mean score obtained by the authors is 2.31, which is similar to our results.

In the herd there is a relatively high percentage of cows with very calm temperament (score 5) over 30 % in both breeds and in the Holstein the percentage is slightly higher. In the Brown Swiss cows the highest is the percentage of the ones with score 3. The share of

cows with nervous and very nervous temperament is rather low in both breeds having in mind that selection by that trait has never been made in our country. High percentage of very nervous cows is reported especially in the Holstein ones. Van Doormal (2007) states only 1 % of cows with score 1 for the Holstein and Brown Swiss breeds in Canada. Totally, the percentage of cows with scores 1 and 2 for both breeds is about 10, while in the studied herd that percentage is higher. In addition, Van Doormal (2007) states very low percentage of the very calm cows from breeds, 5.1 and 3.8 %, respectively. The prevailing share is of cows with scores 3 and 4 (calm and medium calm) in the populations of both breeds in Canada, over 40%.

More important in terms of the normal course of the preparation and actual milking of the animals are the reactions corresponding to scores 1 and 2. These animals do not allow the udder to be cleaned well before milking, they periodically remove the machine during milking and also prevent normal final milking. All this slows down the overall process of milking on the farm and often leads to culling of these cows for various reasons, mostly mastitis. For all breeds in Canada the standard mean ratio of scores 1 and 2 compared to scores from 3 to 5 is adopted to be 10:90% (Van Doormal, 2007). These rates for cows of both breeds in the studied herd are higher, 15.9 and 12.2% for the Holstein and the Brown Swiss, respectively. Thus the relative share of cows with desirable temperament, scores from 3 to 5, are 84.1 and 87.8%, respectively. Abe et al. (2002) in his study for the Holstein cows find out that the very calm and calm cows are 63% and those with undesirable temperament – nervous and very nervous, are 9%.

The highest percentage of calm animals reported by Sewalem et al. (2010) is the cows from the Dairy Shorthorn – 93.36 and Jersey – 91.06%. For the period from 2001 to 2008, a slight increase in the relative share of nervous and very nervous animals is observed in almost all breeds in Canada.

The mean scores for milking temperament vary in cows depending on the number of lactation. Totally, for both breeds an increase of the score from first to third and higher lactation is reported. This can be accounted for by culling of cows with more nervous temperament at later lactations, possible getting used to milking with age, etc. Sewalem et al. (2010) found a statistically significant relationship between milking temperament and the culling rate. Very nervous cows are in risk of culling at 26, 23 and 46% compared to the very calm ones, respectively for the Holstein, Ayrshire and Jersey.

In the Brown Swiss cows in the studied herd the high percentage of cows at first lactation with scores 1 and 2 is due to the fact that all these animals are daughters of the same bull (No. 190740). This bull has a great number of daughters in the herd and the majority of them are in first-lactation (10) and 3 are in second and third lactation. In older cows isolated cases of animals with score 2 are reported and they are daughters of different bulls. This fact shows the need for control and selection for this trait. Abe et al. (2002) study the factors affecting the milking temperament of Holstein cows. They report reliable difference in the temperament between primiparous and older cows and in the progeny of different bulls. No statistically reliable difference in temperament has been found depending on the size of farm.

There are few studies on the relationship between productive traits and milking temperament. Most results show a low correlation between them. Although the differences are not statistically significant, the results of this survey indicate that cows with more nervous temperament have higher milk yield than those with calmer milking temperament. Sullivan and Burnside (1988) found out that the milking temperament has negative correlation with the milk yield (-0.17), but it has high correlation with aggressiveness in feeding, and it in turn is in positive correlation with milk yield (0.23). Summarized, this means that cows exhibiting

more nervous reactions in milking (scores 1 and 2) have more aggressive behaviour in feeding to other animals in the group. This gives them longer and more food intake and consequently has a positive effect on productivity.

The inheritance ratio of the milking temperament trait is relatively low – 0.128 (Sewalem et al., 2011). Some writers obtain slightly higher values. Halle-Mariam and Godard (2010) show slightly higher value in the registered (0.20) compared to the commercial herds (0.09) in Australia. Despite the low rate of inheritance, due to its low but negative correlation with milk productivity and effect on the efficiency of production, the temperament trait is included as a selection trait in many countries.

From the bulls used in the studied herd with more than five daughters, there are only two whose daughters are 100% with scores from 3 to 5. In the other daughters from 75 to 83.3% are with desirable milking temperament. These deviations are not large, given that selection for that trait is not done. However, this may be because it's still a small number of daughters. Muray (2008) states an average for the evaluated Holstein bulls 90.2% daughters with milking temperament scores from medium to very calm, and the variation in the bulls is from 70 to 97%.

The correlations between the ranks of bulls for breeding value for milk yield and temperament and for percentage of daughters with desirable temperament have low and negative value  $r_s = -0.10$  and  $-0.20$ , which means that in a selection for milk yield only there is a risk of increasing the number of animals with undesirable milking temperament. Sewalem et al. (2011) found very low correlations between the breeding values bulls for temperament and the other traits, such as productive, reproductive and conformation traits.

## Conclusions

The average score for milking temperament in Holstein cows is slightly higher than that of the Brown Swiss ones, 3.74 to 3.65 respectively. Cows with nervous type of temperament, scores 1 and 2, comprise a relatively high percentage, slightly more in the Holstein - 15.9%, compared to the Brown Swiss cows - 12.2%. The av-

erage milk yield of nervous and very nervous cows is higher than that of the medium to very calm ones. This difference is greater in the Holstein cows – 744.8 kg, compared to the Brown Swiss ones – 445.2 kg.

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