

The effect of milk yield on conversion coefficients between lactations of Czech Fleckvieh cows

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Abstract: The number of lactations of dairy cows has a high influence on milk production, especially in first three lactations. The observation was carried out in the group of 8144 cows with 75-100% proportion of Czech Fleckvieh cattle in genotype. All cows finished the first three lactations. The total mean milk yield was 6154.45 kg in the first lactation, 7208.32 kg in the second lactation and 7506.72 kg in the third lactation. The coefficient for calculation of the milk yield for 1st, 2nd and 3rd lactation were 1.17; 1.22 and 1.04 respectively. For detailed evaluation of the influence of the estimation coefficients between first three lactations the herd was divided into five groups according to the milk yield in the first lactation (up to 4000 kg, 4001-5000 kg, 5001-6000 kg, 6001-7000 kg and over 7000 kg). For each group the estimation coefficients were calculated. The estimation coefficients between lactations decreased with increasing yield in the first lactation. It was in all cases statistically highly significant.

Key-Words: Czech Fleckvieh, milk yield, conversion coefficients

Introduction

The number of productive lactation has significant decreasing tendency in last years. The influence of number of lactation is unquestionable, therefore the main interests of the farmers are focused on determination the relationships between first three lactations. For the estimation of milk yield for following lactations the estimation coefficients are used. These coefficients are based on relationships between lactations of dairy cows which already was the completed [1]. Already in 1969 [7] the yield in the first five lactations of Czech Fleckvieh cattle was studied. The study from [7] indicates the production in 1st, 2nd, 3rd, 4th and 5th lactation. The yield was 2544.4 kg; 3037.1 kg; 3354.1 kg; 3371.1 kg and 3332.9 kg respectively. The estimation coefficients in this group for 1st, 2nd and 3rd lactation were 1.32; 1.11 and 1.01 respectively.

New estimation coefficients of milk yield were not published for many years. Milk yield between lactations was studied by many authors but the studied group consisted of different dairy cows species with different number of lactations. These calculated estimation coefficients between lactations were influenced by selection of dairy cows with higher number of lactations and by their lower breeding value which is caused by their later date of

birth. [4] also studied milk production in first three lactations of Slovak Pied (3486.6 kg of milk, 4086.8 kg of milk and 4292.0 kg of milk). In Czech republic [6] studied milk yield of Czech Fleckvieh dairy cows in first three lactations (3642 kg, 4106 kg and 4328 kg), [5] declare 3963 kg, 4541 kg and 4739 kg of milk yield in first three lactations of this breed. All authors say that the value of the yield in first lactation influences negatively the prediction of estimation coefficients between all lactations.

As the yield of dairy cows significantly increases, the new question how this increase influences the value of currently used estimation coefficients appears.

The aim of this study was to recalculate estimation coefficients of milk yield in first three lactations in the group of Czech Fleckvieh dairy cows and to determine how the milk yield in the first lactation effects these coefficients.

Material and Methods

The data on the milk yield of 8144 cows were analyzed. The cows were born in the period from 2000-2006 and the fourth lactation had to elapse. All dairy cows were more than 75% Czech Pied breed. The average yield for first, second and third lactation for the whole group was calculated. The

estimation coefficient between first and second lactation, first and third lactation and second and third lactation were calculated. The group was divided into five groups according to milk yield in the first lactation - group A (up to 4000 kg), group B (4001-5000 kg), group C (5001-6000 kg), group D (6001-7000 kg) and group E (over 7001 kg).

The estimation coefficient between first and second lactation, first and third lactation and second and third lactation were calculated for each group as a ratio of milk yield in later lactation to milk yield in earlier lactation. The estimation coefficient and results of milk yield of Czech Pied breed were compared with results of other authors. Estimation coefficients in groups (milk yield) were calculated as simple mean values of individual coefficients. Main statistical parameters mean (\bar{x}), standard deviation (s_x) and coefficient of variation (V_x) of the observed traits and phenotypic correlations (r)

between them were calculated. The significance of differences was tested by STATISTICA 10.

Results and Discussion

The main parameters of milk production in the first three lactations of observed cows are shown in Table 1. The total milk yield in the 1st, 2nd and 3rd lactation was 6154.45 kg; 7208.32 kg and 7506.72 kg respectively. The difference between all lactations was statistically highly significant. The standard deviation (s_x) ranged from 1257.61 in the first lactation to 1524.87 in third lactation. The variation coefficient ranged from 20.31 in the third lactation to 20.67 in the second lactation. The estimation coefficients for all dairy cows in the 1st, 2nd and 3rd lactations were 1.17; 1.22 and 1.04 respectively.

Table 1 Milk yield of dairy cows at different lactation and their estimated coefficients (n = 8144)

lactation	\bar{x}	s_x	V_x	conversion coefficients
first lactation	6154.45 ^A	1257.61	20.43	1.17
second lactation	7208.32 ^B	1489.97	20.67	1.22
third lactation	7506.72 ^C	1524.87	20.31	1.04

The values in the same column marked with different letters (A, B, C) differ highly significantly ($P < 0.01$)

Table 2 The values of the estimated coefficients between the first three lactations of dairy cows Czech Fleckvieh breed at different performance on first lactation

The level of milk production on first lactation

estimated coefficient for the relationship	A up to 4000 kg n = 302	B 4001 to 5000 kg n = 1123	C 5001 to 6000 kg n = 2396	D 6001 to 7000 kg n = 2372	E over 7001 kg n = 1951
1. and 2. lactation	1.46 ^A	1.28 ^A	1.20 ^A	1.16 ^A	1.10 ^A
1. and 3. lactation	1.60 ^B	1.38 ^B	1.26 ^B	1.20 ^B	1.12 ^B
2. and 3. lactation	1.10 ^C	1.07 ^C	1.05 ^C	1.04 ^C	1.02 ^C

The values in the same column marked with different letters (A, B, C) differ highly significantly ($P < 0.01$)

Table 3 Comparison of values of milk production and estimation of coefficients in Czech Fleckvieh cattle between authors

lactation	Mikšík and Poul (1969)		Chládek and Kučera (2003)		Andrýsek et al. (2014)	
	\bar{x}	conversion coefficients	\bar{x}	conversion coefficients	\bar{x}	conversion coefficients
1. and 2. lactation	2544.40	1.19	3799.50	1.14	6154.45	1.17
1. and 3. lactation	3037.70	1.32	4348.50	1.23	7208.32	1.22
2. and 3. lactation	3354.10	1.10	4676.70	1.08	7506.72	1.04

The influence of milk yield were described by [7]. [8] say that dairy cows still grow up to third lactation and much energy is consumed for the growth. Therefore [3, 5, 6] say that the milk yield increases with number of lactations.

The estimation coefficients for dairy cows which were divided into groups according to milk yield in first lactation are shown in Table 2. The estimation coefficients in group A (milk yield up to 4000kg in the first lactation) between first and second lactation, first and third lactation and second and third lactation were 1.46; 1.60 and 1.10 respectively. The estimation coefficients in group B (milk yield from 4001 kg to 5000 kg in the first lactation) between first and second lactation, first and third lactation and second and third lactation were 1.28; 1.38 and 1.07 respectively. The estimation coefficients in group C (milk yield from 5001 kg to 6000 kg) between first and second lactation, first and third lactation and second and third lactation were 1.20; 1.26 and 1.05 respectively. The estimation coefficients in group D (milk yield from 6001 kg to 7000 kg) between first and second lactation, first and third lactation and second and third lactation were 1.16; 1.20 and 1.04 respectively. The estimation coefficients in group E (milk yield over 7001 kg) between first and second lactation, first and third lactation and second and third lactation were 1.10; 1.12 and 1.02 respectively. The highest values of estimation coefficients were calculated for the relationship between first and third lactation. This relationship was not influenced by the value of the yield in the first lactation. This fact is highly significant. As the results show, it is highly significant that with the increase of milk yield in first lactation the value of estimation coefficients decrease.

When comparing our results with results of [7] the yield was higher in first lactation by 4000 kg. Due to this difference the value of estimation coefficients are different. The same conclusion is confirmed by a study of [2] who say that the most significant was in relationship between first and third lactation where the estimation coefficient was the highest. The least significant relationship, as shown in our study, was calculated when comparing second and third lactation. Also the lowest estimation coefficient was calculated. [1] focused on relationships of milk yield of Holstein dairy cows. The estimation coefficient between first and second lactation, first and third lactation and second and third lactation was 1.175; 1.297 and 1.119 respectively. [2] say, that the study was negatively influenced by milk production in first lactation. The positive relationship was determined by relationship

between first and second lactation and first and third lactation. On the other hand the relationship between second and third lactation was negative. The same results were published by [4, 5, 6].

According to [7] in Table 3, the milk yield in first, second and third lactation was 2544.4 kg; 3037.7 kg and 3354.54 kg respectively and also values of estimation coefficient between first and second, first and third and second and third were 1.19; 1.32 and 1.10 respectively. [2] determined the milk yield of 75 and more % Czech Fleckvieh cattle in first, second and third is 3799.5 kg; 4348.5 kg and 4676.7 kg respectively. Values of estimation coefficients between first and second lactation, first and third lactation and second and third lactation were 1.14; 1.23 and 1.08 respectively.

The milk yield of our monitored group in first, second and third lactation was 6154.45 kg; 7208.32 kg and 7506.72 kg respectively. Estimation coefficients between first and second, first and third and second and third were 1.17; 1.22 and 1.04 respectively.

Comparing the data with [7] the of Czech Fleckvieh dairy cows increased the milk yield in first lactation by 3619.05 kg, in second lactation by 4170.62 kg and in third lactation by 4152.62 kg. Comparing the data with average yield determined by [2] the milk yield increased by 2354.95 kg in first lactation, by 2895.82 kg in second lactation and by 2830.02 kg in third lactation. There is a significant decrease of estimation coefficient in relation between first and second lactation by 0.02 in comparison to [7] and increase of estimation coefficient by 0.03 in comparison to [2]. The estimation coefficient in the relationship between first and third lactation decreased in comparison to [7] and are comparable with [2] where the difference was 0.01. The relationship between second and third lactation had the lowest estimation coefficient in our study as well as in study of [7] where the difference was 0.06 and also in study of [2] where the difference was 0.04.

Conclusion

This study declares that the increase of the milk yield in first lactation is accompanied by decrease of estimation coefficients between all three lactations. This relationship is declared by high significantly of measured data. We assume that dairy cows with high milk yield in first lactation will have only a small yield increase in second and third lactation. The dairy cow with low milk yield in the first lactation is assumed to increase significantly the yield in second and third lactation.

The lowest numbers of estimation coefficients achieved between second and third lactation. Higher values of estimation coefficients between first and second lactation and more significant relationship between first and third lactation reveals a significant ability to compensate the yield in first three lactations. It means that dairy cows with high increase of milk yield after first lactation will probably not repeat this increase after starting second and third lactation. The results show that the difference between average yield in second and third lactation was not highly significant and the yield stagnated. We assume that dairy cows with small increase of milk after first lactation will highly increase the yield after second lactation. Interesting results appeared after comparing our results with previous studies. The estimation coefficients between three lactations of the same dairy cows are relatively stable. However the yield of monitored dairy cows was significantly higher than in previous studies, the values of estimation coefficients are conform and have the same tendency. In concrete population the dairy cows above average yield in first lactation have lower values of estimation coefficient and the dairy cows with average yield in first lactation have higher values of estimation coefficient between other lactations.

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