Influence of Various Factors on Traits of Milk Production in Selected Dairy Cows of the Slovak Spotted Cattle

Jozef Bujko[1*], Juraj Candrák[1], Peter Strapák[2], Július Žitný[1], Cyril Hrnčár[3], Rastislav Bernát[4]

[1]Department of Genetic and Animal Breeding Biology, Faculty of Agrobiology and Food Resources, Slovak Agricultural University in Nitra, A. Hlinku 2, 949 76 Nitra, Slovak Republic,
[2]Department of Animal Husbandry, Faculty of Agrobiology and Food Resources, Slovak Agricultural University in Nitra, A. Hlinku 2, 949 76 Nitra, Slovak Republic,
[3]Department of Small Animal Science, Faculty of Agrobiology and Food Resources, Slovak Agricultural University in Nitra, A. Hlinku 2, 949 76 Nitra, Slovak Republic,
[4]Department of Quality and Engineering Technologies, Faculty of Engineering, Slovak Agricultural University in Nitra, A. Hlinku 2, 949 76 Nitra, Slovak Republic,

Abstract
The study aimed to examine the analyses a chosen group of the Slovak Spotted dairy cows. Within the group we focused on the problematic of utility pointers evaluation, we analysed the milk production of various breed types, years of birth giving, paternity of the descendants and the order of lactation. Moreover, we assessed the mutual correlation dependence between milk production pointers and weight of various factors on milk, fats, proteins and lactose production. The highest amount of produced milk in kg due to breed type measure was in S_0 type. Evaluating the year of birth giving, the milk production was the highest between the years of 2010-2016 in a herd of dairy cows at farm reaching 8,341 kg of milk. Milk production pointers such as milk production in kg, fats in kg, proteins in kg and lactose in kg are in a mutual correlation relationship that is highly statistically resulted $P \leq 0.001$.

Keywords: coefficient of determination, dairy cows, factors, milk traits, Slovak Spotted cattle

1. Introduction

Simmental is among the oldest and most widely distributed of all breeds of cattle in the world. The dairy cows of the Simmental breed are able to well adapt into foothill conditions and combine high genetic potential of milk and meat productivity [1]. Slovak Spotted breed is a dual-purpose breed with a good milk and meat production [2, 3], which belongs to the Simmental type of cattle.
The evaluation of milk production in dairy cows of the Simmental cattle show authors in Slovakia [4-7], Bulgaria [8], Serbia [9], Romanian [10, 11], Poland [12] and other authors [13-17].

* Corresponding author: Ing. Jozef Bujko, PhD., +421 37 641 4294, Jozef.Bujko@uniag.sk

The many studies was to evaluate the influence of genetics factors such as: the breed, the sire, the sex Adediran et al. [18], Bujko et al. [14] and non-genetic factors Bujko et al. [13, 14] Cobanoglu and Ertugrul [19], Bolacali and Öztürk [20] and nutrition and feeding Juraček et al. [21].
The aim of this study was evaluated influence of various factors on traits of milk production in selected herd of dairy cows of the Slovak Spotted cattle.

2. Materials and methods

The material of selected breeding herd of Slovak Spotted cattle was provided from the database of Breeding Services of the Slovak Republic [22].
A total of 1,359 dairy cows calving between 2010 and 2016 were observed during evaluation.

We divided dairy cows only breed-type S_0 - cows with genetic proportion of pure Slovak Spotted blood into 87.5 %, S_1 - cows with genetic proportion of pure Slovak Spotted blood from 75 % to 87.4 %, S_2 - cows with genetic proportion of pure Slovak spotted blood from 50 % to 74.9 % [23].

The basic statistic analysis of traits of milk production (MY, FY, PY and LY) were analysed using the Statistical Analysis System (SAS) version 9.4 Enterprise Guide 3.0 24]. For the actual computation a linear model with fixed effects was used:

$$y_{ijklm} = \mu + HYS_i + b_j + c_k + d_l + e_{ijklmn}$$

, where: μ = mean value, HYS_i = effect of herd, years and season, b_j = father, c_k = breeding type, d_l = number of lactation, e_{ijklmn} = residual error

Statistical evaluations of the differences between traits were tested at the levels of statistical significance: $^{+}$ P<0.05, $^{++}$ P<0.01, $^{+++}$ P<0.001 or $^{-}$P>0.05.

3. Results and discussion

The basic traits of milk production (MY, FY, PY and LY) in evaluated breeding herd of dairy cows Slovak Spotted breed are presented in Table 1. In the first lactations, the average production was 6,806.08 ± 1,821.32 kg of milk, 267.23 ± 68.22 kg of fat, 234.40 ± 62.09 kg of protein and 333.78 ± 91.93 kg of lactose. In other lactations, there was rising tendency in traits of milk production. These results correspondences with conclusions Karamfilov and Nikolov [8], Perišić et al. [9], Nistor et al. [10].

Table 1. Statistical characteristic of milk in kg (MY), fat in kg (FY), proteins in kg (PY) and lactose in kg (LY) in dairy cows of the Slovak Spotted cattle

Traits		Statistical parameter					
		n[1]	$\bar{x}$ [2]	SD[3]	CV[4]	MEDIAN[5]	MODUS[6]
1st lactation	milk (kg)	429	6,806.08	1,821.32	26.76	7,039.0	6,196.0
	fat (kg)		267.23	68.22	25.53	278.64	258.3
	protein (kg)		234.40	62.09	26.49	245.11	158.35
	lactose (kg)		333.78	91.93	27.54	345.52	279.14
2nd lactation	milk (kg)	277	7,282.32	1,964.73	26.98	7,433.0	5,198.0
	fat (kg)		291.7	76.48	26.22	299.82	108.46
	protein (kg)		254.48	68.95	27.09	260.42	217.88
	lactose (kg)		350.32	98.13	28.01	354.54	205.3
3rd lactation	milk (kg)	260	7,461.47	2,158.18	28.92	7,734.0	8341.0
	fat (kg)		299.28	86.9	29.04	311.62	261.03
	protein (kg)		258.15	76.24	29.53	270.4	262.28
	lactose (kg)		354.81	106.29	29.96	369.77	235.7
4th lactation	milk (kg)	193	7,576.92	2,252.16	29.72	7,865.0	4,875.0
	fat (kg)		301.66	90.61	30.04	311.36	311.36
	protein (kg)		262.52	78.68	29.97	272.01	262.62
	lactose (kg)		358.81	109.93	30.64	365.63	.
5th and other lactation	milk (kg)	200	7,190.06	2,291.2	31.87	7,533.0	6,758.0
	fat (kg)		280.56	90.54	32.27	296.38	-
	protein (kg)		245.06	78.6	32.07	260.52	-
	lactose (kg)		340.12	112.39	33.04	353.42	299.27

[1]number of observations, [2]average, [3]standard deviation, [4]coefficient of variation, [5]mode (value that appears most often in a set of data), [6]median (value separating the higher half from the lower half of a data sample)

By evaluation of milk productions by breeding type we found out that the high average of milk production traits in S_1 (7,311.21 kg for milk) and lower in S_2 (6,988.02 kg for milk) as shows Table 2.

Similar tendency was in others breeding type. These results conform to the breed standard

Slovak spotted breed [23] and conclusion results Strapák et al. [4].

Table 2. Statistical characteristic of milk in kg (MY), fat in kg (FY), and proteins in kg (PY) and lactose in kg (LY) in dairy cows of Slovak Spotted cattle by breeding type

Traits		Statistical parameter					
		n[1]	$\bar{x}$ [2]	SD[3]	CV[4]	MEDIAN[5]	MODUS[6]
S0	milk (kg)	836	7,198.19	2,027.76	28.17	7,426.5	7,847.0
	fat (kg)		284.43	79.17	27.83	293.93	328.34
	protein (kg)		249.47	70.22	28.15	258.69	171.38
	lactose (kg)		347.54	100.42	28.89	357.78	356.21
S1	milk (kg)	282	7,311.21	2,069.25	28.30	7,479.0	6,417.0
	fat (kg)		289.31	81.91	28.31	295.33	219.81
	protein (kg)		252.34	72.3	28.65	259.39	300.46
	lactose (kg)		350.77	101.84	29.03	360.26	322.28
S2	milk (kg)	241	6,988.02	2,088.31	29.88	7,250.50	5,113.0
	fat (kg)		282.32	83.52	29.58	291.61	245.56
	protein (kg)		240.81	73.51	30.53	250.22	176.97
	lactose (kg)		333.30	102.33	30.70	345.04	205.3

[1]number of observations, [2]average, [3]standard deviation, [4]coefficient of variation, [5]median (value separating the higher half from the lower half of a data sample), [6] mode (value that appears most often in a set of data),

The correlation among the traits of milk production (MY, FY, PY and LY), for example milk in kgs with fat in kgs, fat in %, protein in kgs, proteins in %, lactose in kgs and lactose in %, was found as follows r = 0.94373, r= -0.18025, r = 0.97888, r = 0.03948, r = 0.03948, r = 0.99325 and r = 0.20733 (Table 3). These coefficients were statistically high significant. These results are correspondence with conclusions Karamfilov and Nikolov [8], Bujko et al. [3, 14] and other authors.

Table 3. Relation between milk production and other traits of milk production

	Milk in kg	Fat in kg	Fat in %	Proteins in kg	Proteins in %	Lactose in kg	Lactose in %
Milk in kg	-	0.94373^{+++}	-0.18025^{+++}	0.97888^{+++}	0.03948^{+}	0.99325^{+++}	0.20733^{++}
Fat in kg		-	0.13643^{+++}	0.95593^{+++}	0.18740^{+++}	0.93143^{+++}	0.15084^{+++}
Fat in %			-	-0.09012^{+++}	0.42950^{+++}	-0.19639^{+++}	-0.18557^{+++}
Proteins in kg				-	0.23110^{+++}	0.97132^{+++}	0.20099^{+++}
Proteins in %					-	0.03519^{-}	-0.00306^{-}
Lactose in kg						-	0.31213^{+++}

$^{+}$ P<0.05, $^{++}$ P<0.01, $^{+++}$ P<0.001 or $^{-}$ P>0.05.

In Table 4 showed the linear model to represent coefficients of determination on MY, FY, PY and LY of dairy cows. The factor of the HYS of MY, FY, PY and LY were evaluated as highly provable (P <0.0001) with a determination coefficients from 0.204532 % for FY to 0.307179 % for LY. For sire's influence, we achieved a statistically significant values (P <0.0001). The determinant coefficients were from 0.098068 % for FY to 0.147864 % for LY. These results are similar with results Adediran et al. [18], Cobanoglu and Ertugrul [19] and Bolacali and Öztürk [20], where authors show the highest of effect HYS, than of effect the sire.

Table 4. Analysis of variance on MY, FY, PY and LY of dairy cows in Slovak Spotted cattle

Sources of variability	DF[1]	F Value	R-Square [2] MY	F Value	R-Square [2] FY	F Value	R-Square [2] PY	F Value	R-Square [2] LY
Herd- Years-Season (HYS)	76	14.45^{+++}	0.272218	9.93^{+++}	0.204532	14.38^{+++}	0.271304	17.13^{+++}	0.307179
Sire	57	7.08^{+++}	0.134742	5.66^{+++}	0.098068	7.69^{+++}	0.128412	9.04^{+++}	0.147864
Breeding type	3	3.76^{+}	0.050956	1.29^{-}	0.000865	4.22^{++}	0.002835	5.13^{++}	0.003444
Parity	5	11.39^{+++}	0.026197	15.98^{+++}	0.036362	13.05^{+++}	0.029897	6.42^{+++}	0.014929

[1]degrees of freedom, [2]coefficient of determination (R^2), $^{++}$ P<0.01, $^{+++}$ P<0.001 or $^{-}$ P>0.05.

4. Conclusions

In conclusion, we noted that the correlations among the traits of milk production were statistically high significant. The analyses of effect milk production showed the highest effect of herd-years-season.

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