

Evaluation the Birth Weight of Calves in Selected Herds of Slovak Spotted Cattle

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Abstract

The aim of this study was to evaluate the birth weight of calves of the Slovak Spotted cattle in selected herds according to the year of birth, breeder, period of birth and breed type and to determine the linear relation between birth weight and birth year, month of birth, breed type, breeding conditions, calf sire and period of calving. In our measurements, the average weight at birth of 284 evaluated measurements for the years 2012 to 2017 in the three breed types was 46.24 kg. For the breeding environment, breeding type and year of birth we did not achieve statistically conclusive data ($P > 0.05$). The factor of the month of birth was evaluated as highly provable ($P < 0.0001$) with a determination coefficient of 36.42% and $F = 19.70$. For sire influence, we achieved a statistically significant value ($P < 0.0197$). The determinant was 27.89%, $F = 1.50$.

Keywords: calf birth weight, cattle, coefficient of determination, factors, Slovak Spotted cattle

1. Introduction

Birth weight is a characteristic of great economic importance in the cattle industry. In dairy cattle, this trait has been comprehensively studied by different researchers in several places among different breeds [1, 2].

Genetic heritability of birth weight only counts for about 45 percent with the remaining 55 percent being caused by environmental conditions [3, 4].

The many studies were to evaluate the influence of genetics factors such as: the breed, the sire, the sex Strapák [5], Strapák et al. [6] and non-genetic factors as the breeding conditions Hozáková et al. [7], the birth season Krupa et al. [8], Toušová et al. [9], the dam's age at calving Krupa et al. [5] and others as Szabo et al. [10], Yaylak et al. [11],

Strapák et al. [12], Cundiff et al. [13], Hickson et al. [14], Salehi et al. [15] and Vostrý et al. [16].

The aim of this study was to evaluate the birth weight of calves of the Slovak spotted cattle in selected herds.

2. Materials and methods

The material of three breeding herds of Slovak Spotted cattle was provided from the database of Breeding Services of the Slovak republic [17].

A total of 284 calves born between 2012 and 2017 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 % [18].

The basic statistical and variability characteristics (least square means, standard deviations) were

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evaluated using the Statistical System (SAS) version 9.3 [19].

The mixed procedure was used for the final analysis. The value of statistical significance (P), the value of the F-test and the coefficient of determination (R^2) of the above-mentioned growth traits were evaluated with its relation to: herd, year and month of birth, breeding type and sire.

For the actual computation a linear model with fixed effects was used:

$$y_{ijklm} = \mu + H_i + YB_j + MB_k + BT_l + F_m + e_{ijkl}$$

where: μ = mean value of depended variable, H_i = fixed effect of herd (1 - 3), YB_j = fixed effect of years of birth (1 - 7), MB_k = fixed effect of month of birth (1 - 10), ST = fixed effect of breeding type (1 - 3), F_m = fixed effect of father (1 - 59), e_{ijkl} = 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 average value of birth weight of calves was 46.24 ± 11.60 kg, where the value that appears most often in a set of data was 45 kg. These result correspondence with conclusion Strapák et al. [5, 6]. In Table 1 are presented results in selected breeding herds of Slovak Spotted cattle.

These results are similar with conclusions Hickson et al. [14], Salehi et al. [15] and Vostrý et al. [16], where average values birth weight has fluctuating tendency.

Table 1. Birth weight of calves for individual herds

Herd	Statistical parameter					
	n ¹	\bar{x} ²	SD ³	CV ⁴	MODE ⁵	MEDIAN ⁶
A	183	46.5	11.39	24.48	45	45
B	74	46.8	13.02	27.83	55	48
C	27	42.9	8.15	19.01	37	46

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

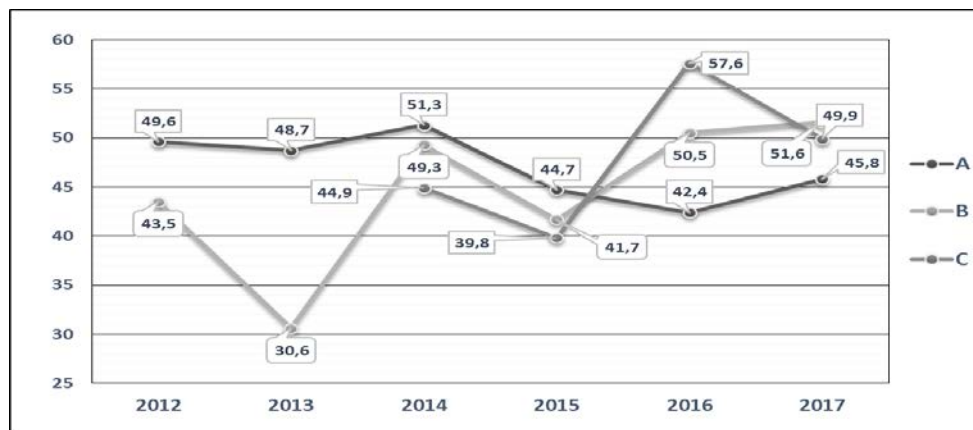


Figure 1. Birth weight of calves on breeding herds in individual years

Figure 1 shows the differences for birth weight of calves by years 2012 to 2017 on farms of Slovak Spotted cattle. In breeding herd A values were between 44.7 to 57.6 kg, the similar

tendency was observed in breeding herds B and C, but values were lower than A. The highest average values were in years 2016 (42.4 to 57.6 kg.).

Table 2. Birth weight of calves for individual herds by breeding type

Herd	Breeding type	Statistical parameter					
		n ¹	\bar{x} ²	SD ³	CV ⁴	MODE ⁵	MEDIAN ⁶
A	S ₀	170	46.5	11.52	24.78	45	45
	S ₁	13	47.0	9.98	21.23	-	43
B	S ₀	52	46.3	13.61	29.42	55	47
	S ₁	14	47.2	11.25	23.81	-	47
	S ₂	8	49.5	13.16	26.60	-	51
C	S ₀	21	43.9	7.47	17.03	37	47
	S ₁	5	38.1	10.82	28.39	-	38
	S ₂	1	46.1	-	-	46	46

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

The basic statistics of birth weight of calves by breeding type in breeding herds of Slovak Spotted cattle are presented in Table 2. In the breeding type S₀ average values were between 43.9 ± 7.47 (herd C) to 47.2 ± 11.25 (herd B). The highest number of calves evaluated was in herd A (170 of calves),

where the average weight was 46.5 ± 11.52 kg. Similar tendency was in others breeding types. These results were conform to the breed standard Slovak Spotted breed [18] and conclusion results Strapák et al. [6].

Table 3. Factors affecting on birth weight of calves in Slovak spotted cattle

Sources of variability	DF ¹	Mean Square	BW_Mean	CV ⁴	F Value	R-Square ² birth weight of calves (BW)
Herd	2	171.7067106		25.053	1.28 ⁻	0.009023
Year_birth	6	273.451012		24.795	2.08 ⁻	0.043109
Month_birth	9	1732.97073	46.24	20.284	19.70 ⁺⁺⁺	0.364262
Breeding_type	2	41.34251319		25.139	0.31 ⁻	0.002173
Father	58	182.98654		23.884	1.50 ⁺⁺	0.278856

¹grades of freedom, ²coefficient of variation, ³coefficient of determination (R²), ⁴CV, ⁺P<0.01, ⁺⁺P<0.001 or ⁺⁺⁺P>0.05.

Table 3 shows the linear model to represent coefficients of determination on birth weight of calves. The factor of the month of birth was evaluated as highly provable (P < 0.0001) with a determination coefficient of 36.42% and F = 19.70. For sire influence, we achieved a statistically significant value (P < 0.0197). The determinant was 27.89%, F = 1.50. These results are similar with results obtained by Hozáková et al. [7] Krupa et al. [8], Toušová et al. [9], Parish et al. [20] and Manzi et al. [21], where authors shows the highest effect of HYS.

4. Conclusions

The birth weight of calves in selected herds of Slovak Spotted cattle was 46.24 ± 11.60 kg, where

the value that appears most often in a set of data was 45 kg. The analyses by the effects birth weight of calves were the highest effect of birth month (MB) 36.42% and F = 19.70, then, the effect of sire 27.88 % and F= 1.50. These results were statistically highly significant.

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