Animal welfare, etológia és tartástechnológia

Animal welfare, ethology and housing systems

Volume 16 Issue 1

Gödöllő
2020

THE USE OF SLOVAK SIMMENTAL BREED IN SUCKLER BEEF SYSTEM

Klára Vavrišínová[1], Katarína Hozáková[1], Peter Juhás[1], Martin Janíček[1], Milan Margetín[1], Peter Obtulovič[2]

Slovak University of Agriculture, Nitra, Slovakia
[1]Department of Animal Husbandry, Faculty of Agrobiology and Food Resources
[2]Department of Statistics and Operations Research, Faculty of Economics and Management
949 76 Nitra (SK), Tr. A. Hlinku 2
klara.vavrisinova@uniag.sk

Received – Érkezett: .10. 12. 2019.
Accepted – Elfogadva: 04. 04. 2020.

Abstract

The aim of this study was to monitor productive characteristics of Slovak Simmental breed and crossbreeds of different proportion (>50% of Slovak Simmental breed) in the system of suckling beef in Slovakia. Study evaluated a total of 932 animals for growth parameters and 75 animals for carcass characteristics. Analysing of calving ease showed 4.95% proportion of calving with assistance (calving ease score 2 from 4 point scale). These were found in calving of one gender – heifers. All other recorded calving was without need of assistance. Analysis of variance confirmed highly significant influence of the sire on calving difficulty ($P<0.001$) and significant impact of the sex and birth season as well ($P<0.01$). Higher live weight at birth was determined in bulls (32.90 kg vs. 31.13 kg). Similarly, analysis of variance of the birth weight verified highly significant influence of the sire ($P<0.001$). In monitored herds, cows calved throughout the year, with highest percentage of calving in winter season (from January to March) – 36.5%. On the other hand, fewer cows calved in the season between July and September (4.99%). The highest average live weight at 120 days according to the calving season was determined in calves born in February (216.78 kg). Within evaluation of impact of the calving season on growth characteristics, highly significant influence on the birth weight ($P<0.001$) and significant influence on weaning weight ($P<0.05$) were determined. Average dressing percentage of bulls was 54.97%; the highest number of slaughtered bulls (70%) was designated in commercial class E/2 and U/2.
Keywords: calving season, carcass class, growth parameters, Slovak Simmental breed, suckling beef

Introduction

Breeding of specialized beef breeds, respectively crossbreeds of local breeds with imported beef breeds doesn't have a long tradition in our latitudes. The breeding of these utility types began to be systematically expanded only after 1990s, when actually began to write the history of the beef industry in the system of the non-milking cattle population. The diverse soil-climatic and landscape relief conditions of Slovakia provide a prerequisite for the application of a wide range of breeding different breed and utility types of cattle. Slovakia is a relatively rich source of permanent

10.17205/SZIE.AWETH.2020.1.029

grassland; unfortunately, compared to countries with similar production conditions are considerably untapped. The most appropriate use of these areas is the extension of beef breeding, both pure-bred and their crossbreeds. Currently there are 3097 pieces of pure-bred cows of Slovak Simmental breed and 376 pieces of crosses in the herd book of beef cattle. Breeding of beef cattle differs from milking cattle in terms of low input investment to the feed, labor and animal housing (*Zahrádková et al*., 2009). Nowadays, the expansion of beef cattle and suckling cows breeding causes not only the demand for quality meat, but also a societal purpose that promotes the sustainability of agriculture, the maintenance of the landscape in cultural character (*Golda et al*., 2000). In beef cattle breeding, all the properties that directly or indirectly affect the production and carcass value of the animal and thus the economy of the whole herd are important. The most important utility characteristics are summarized in the following categories: general; characteristics associated with production and rearing of calves; fattening characteristics; and carcass characteristics (*Szabó*, 1998).

The aim of this work was to monitor production indicators of Slovak Simmental cattle and its crosses kept in the system of beef cattle and suckling cows.

Material and methods

A total of 1007 animals of Slovak Simmental breed and its crossbreeds in the system of beef cattle and nursing cows were observed during evaluation. The analyzed data of animals was provided from the background materials of The Beef Cattle Breeders Association in Slovakia as well as from registers of farms. The study evaluated data of the numbers and individual calving ease scores according to the designed methodology with 4 point scale as follows – unassisted calving (1), easy or normal pull (2), hard pull (3) or veterinarian assistance (4). To control the growth ability of calves up to the weaning, study evaluates the birth live weight (BLW), live weight at 120 days of age (LW120), live weight at 210 days – weaning weight (LW210), average daily gain from birth to 120 days (ADG–1) and average daily gain between birth and 210 days (ADG–2). The above mentioned growth parameters of calves were evaluated with its relation to the season of calving: winter (A) calved from January to March; spring (B) calves born from April to June; summer (C) calves born between July and September; and autumn (D) calves born from October to December. The influence of factor birth live weight (BLW) was tested according to four groups: group 1 represents animal with BLW under 30 kg; group 2 were animals with BLW between 30.1 and 35 kg; group 3 included animals with BLW between 35.1 and 40 kg; and group 4 included animals with BLW over 40.1 kg. Within the evaluation of slaughter characteristics, slaughter weight (SLW), age at slaughter (AS), carcass weight (CW), dressing percentage (DP), netto gain (NG), average carcass fleshiness grade (ACFHG) and average carcass fatness grade (ACFSG) were the analyzed characteristics. Moreover, carcasses of different slaughter categories (heifers, young bulls and bulls) were classified into SEUROP classification grading system with individual scores as following: S+E = 1; U = 2; R = 3; O = 4; P = 5. Scores for fatness were assigned to grades 1 – 5. The basic statistical and variability characteristics (least square means, standard deviations) were evaluated using the Statistical Analysis System (SAS) version 9.3 (TS1M2) Enterprise Guide 5.1. (SAS INSTITUTE Inc., 2011). For the impact of verification of selected factors on the growth and carcass characteristics analysis of variance (ANOVA) was used. Statistical evaluations of the differences between monitored characteristics were tested at the levels of statistical significance: *** $P<0.001$; ** $P<0.01$; * $P<0.05$; ns not significant.

10.17205/SZIE.AWETH.2020.1.029

Results and discussion

The values given in *Table 1* describe proportions of calving and average live weight of calves in relation to the calving difficulty scores. Pull with need of assistance were detected in only 4.95% of female population; however these occurrences were not related to the increased live weight of calves. *Olšanská and Candrák* (2018) reported 86.54% spontaneous calving in Slovak Simmental breed. The highest live weight of calves was found in bulls – 32.90 kg. Since the only market product of the beef cattle is a reared calf for the meat production, reproduction is the decisive economic indicator in this breeding system. Reproduction is influenced by a number of factors; the decisive factors are the health of the cows, quality of feeding, breeding environment, quality of sires, calving ease, herd management and others (*Mackinnon et al*., 1990, *Cushman et al*., 2007).

***Table 1*: Proportions of calving and average live weight of calves according to calving difficulty scores**

Sex	Calving difficulty score							
	1		2		3		4	
	n	%	n	%	n	%	n	%
heifer	659	95.05	33	4.95	-		-	
bull	273	100,00			-		-	
Live birth weight (kg)								
heifer	31.13		31.03		-		-	
bull	32.90				-		-	

The effect of sire, sex of calves, season of birth and birth weight on calving difficulty is described in *Table 2*. Factors sire, sex of calf and birth weight statistically significantly influenced calving difficulty at the level of significance $P<0.001$. Sire is considered to be an important factor affecting the calving ease, while manifesting in the gestation length, birth weight of calf and its body measurements (*Gregory et al*., 1991). *Strapák et al.* (2000) found in Slovak Simmental breed as a largest and high significant effect of breed and birth weight of calves.

***Table 2*: Analysis of the influence of various factors on calving difficulty**

Dependent variable: Calving difficulty				
Source	**df**	**Mean square**	**F**	**Sign.**
Sire	18	1.51	47.51	***
Sex of calf	1	0.62	12.08	***
Season of birth	3	0.22	3.02	*
Live birth weight	3	0.72	7.92	***

10.17205/SZIE.AWETH.2020.1.029

Higher average score for calving difficulty (*Table 3*) was found in born heifers. For other monitored growth characteristics we found higher values in male population of calves. *Bujko et al.* (2019) reported for Slovak Simmental calves higher live birth weight (46.5 kg).

***Table 3*: Basic statistical characteristics of growth in monitored group of calves**

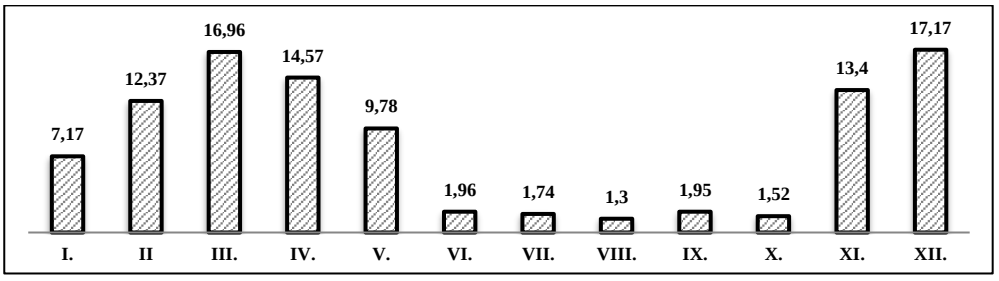
	Heifer (n = 692)	**Bulls (n = 315)**
	$\bar{x} \pm s$	$\bar{x} \pm s$
Average SCD	1.05 ± 0.22	1.00 ± 0.00
BLW (kg)	31.13 ± 3.27	32.90 ± 3.76
LW120 (kg)	123.88 ± 26.06	136.42 ± 28.17
LW210 (kg)	202.25 ± 38.12	217.34 ± 43.33
ADG1 (kg)	0.89 ± 0.23	0.97 ± 0.23
ADG2 (kg)	0.86 ± 0.20	0.93 ± 0.24

SCD – score for calving difficulty

Figure 1 describes distribution of calving throughout the year. The highest proportion of calving was determined in winter calving season (36.5%). Contrariwise, least calves were born in summer (4.99%), especially in July.

Significant differences in birth weight in relation to the month of calving (*Table 4*) were determined (P<0.001). Heaviest calves were born from July to October (>33 kg). In pre-weaning period average daily gains were different within individual months. The lightest gains were found in calves born in November (0.82 kg) and December (0.86). This is in accordance with statement of *Crosson* (2015) that grazing of calves with mothers on pasture increase effectiveness of beef production through more intensive growth rate on cheaper feeding sources. On the other hand, authors *Bjelka and Homola* (2006) noted excellent growth intensity of Simmental calves born in winter and pre-spring season (1.15 – 1.35 kg).

***Figure 1*: Distribution of calving throughout the year (%)**



10.17205/SZIE.AWETH.2020.1.029

***Table 4*: Growth characteristics of monitored calves in relation to the calving season**

Birth month	ASCD	LBW (kg)	LW120 (kg)	LW210 (kg)	ADG1 (kg)	ADG2 (kg)
I.	1.03	32.42	127.69	209.82	0.91	0.89
II.	1.00	31.80	131.25	216.78	0.94	0.93
III.	1.08	31.32	127.59	201.57	0.92	0.86
IV.	1.03	30.62	126.65	206.45	0.91	0.89
V	1.02	31.72	126.37	207.90	0.92	0.89
VI.	1.00	32.12	120.12	196.48	0.84	0.83
VII.	1.05	33.11	132.11	210.00	0.93	0.87
VIII.	1.00	33.35	132.00	209.09	0.94	0.86
IX.	1.00	33.20	135.47	208.80	0.95	0.87
X.	1.00	33.29	123.71	187.43	0.88	0.76
XI.	1.08	31.22	117.75	193.44	0.82	0.81
XII.	1.00	30.70	122.15	211.60	0.86	0.88

ASCD – average score for calving difficulty

According to the season of born calves in Hungary, the highest weaning weight was determined in calves born in summer (*Szabó et al*., 2006). A multi-factor analysis (*Table 5*) shows highly significant relations of the season of calving with the live weight at birth. Factor sex of calves had the greatest influence on most of the monitored characteristics. *Griffin* (2011) reported not significant effect of the season of calving on birth weight; but significant effect on weaning weight of calves. According to *Titterington et al*. (2014) calving season did not influenced required slaughter weight in heifers.

***Table 5*: Analysis of the influence of calving season and sex of calves on the monitored traits**

Source	Dependent Variable	Mean Square	$F_{(3.1007)}$	Sig.
Calving season	Live birth weight	84.65	5.79	***
	Live weight at 210 days	1830.27	1.17	*
Source	**Dependent Variable**	**Mean Square**	**$F_{(1.1007)}$**	**Sig.**
Sex of calves	Live birth weight	492.02	34.22	***
	Live weight at 210 days	15731.36	10.22	***

Higher values of slaughter characteristics were determined in the category of bulls (*Table 6*). Higher carcass fleshiness was found in slaughtered bulls (1.65) compare to heifers (2.50). Contrariwise, carcasses of heifers had higher scores for fatness. Our results of dressing percentage in the Slovak Simmental bulls showed a lower value (54.97%) compared to the results of *Bartoň et al.* (2003), who noted dressing percentage of 57.3% in the Czech Spotted Breed. The lower values of dressing percentage in the monitored group compared to the literature as well as our other findings could be explained by the fact that even we evaluated animals with proportion >50% of Slovak Simmental, in monitored group were also Slovak Simmental crossbreeds with milking breeds in different proportions.

10.17205/SZIE.AWETH.2020.1.029

***Table 6*: Statistical characteristics of slaughter value of monitored animals**

Slaughter characteristics	Heifer (n = 55)	Bulls (n = 20)
	$\bar{x} \pm s$	$\bar{x} \pm s$
SW (kg)	417.12 ± 86.29	560.74 ± 60.61
AS (months)	26.31 ± 5.53	24.10 ± 1.07
CW (kg)	215.35 ± 45.25	307.06 ± 32.78
DP (%)	51.61 ± 0.72	54.97 ± 0.05
NG (g)	285.64 ± 58.33	424.83 ± 52.60
ACFHG	2.50 ± 1.05	1.65 ± 0.46
ACFSG	2.32 ± 0.77	1.96 ± 0.24

Following the values given in Table 7, most of monitored slaughter characteristics were influenced statistically highly significant ($P<0.001$) by slaughter category. Live weight at birth did not influenced slaughter parameters ($P>0.05$).

***Table 7*: Analysis of influence of various factors on selected slaughter characteristics**

Source	**Dependent Variable**	**Mean Square**	**$F_{(1.77)}$**	**Sig.**
Slaughter category	Carcass weight	351265.46	154.10	***
	Dressing percentage	273.47	1696.52	***
	Netto gain	734438.46	113.24	***
	Average carcass fleshiness grade	8.88	13.24	***
	Average carcass fatness grade	1.01	2.88	ns
Source	**Dependent Variable**	**Mean Square**	**$F_{(3.77)}$**	**Sig.**
Birth live weight	Carcass weight	25.01	0.50	ns
	Dressing percentage	14565.42	0.65	ns
	Netto gain	2.90	0.97	ns
	Average carcass fleshiness grade	14984.96	1.06	ns
	Average carcass fatness grade	0.88	1.15	ns
Source	**Dependent Variable**	**Mean Square**	**$F_{(35.77)}$**	**Sig.**
Live weight at 210 days	Carcass weight	52.13	2.19	***
	Dressing percentage	27622.84	1.64	*
	Netto gain	3.29	1.91	*
	Average carcass fleshiness grade	0.87	1.30	ns
	Average carcass fatness grade	0.37	1.05	ns

According to SEUROP classification grading system 35% of bulls were classified in grade of fleshiness E/2. The highest percentage of heifers was classified in the grade E/2 and R/2 (18.18%). Significant and positive correlations between age at slaughter and slaughter weight as well as between slaughter weight and dressing percentage were revealed. Contrariwise, negative highly significant correlation was found between age at slaughter and netto gain, since weight gain

10.17205/SZIE.AWETH.2020.1.029

decreases with age of animal. Different to our finding, *Ćirić et al.* (2017) noted negative correlation between slaughter weight and dressing percentage.

Conclusion

In monitored representative sample of animals, predominantly easy, unproblematic calving was found. Within the verification of the effect of live weight at birth on the calving difficult score was determined significant influence at the level $P<0.001$. Within the evaluation of the organization of the calving season, any strict organization as winter, resp. spring calving were not revealed. In winter season calved 36.5% of monitored cows, contrariwise less calves were born in summer calving season (4.99%). Highest percentage of calving were noted in December (17.17%), March (16.96%) and April (14.57%). High growth intensity of calves was determined in calves under the age of 120 days, which can be related to the excellent milk yield of cows of monitored breed. Our results confirmed differences in growth characteristics between sexes of calves. Based on the analysis of variance, season of calving significantly influenced the live weight of calves at birth at the level of significance $P<0.001$.

Acknowledgement
The project was supported by the Grant KEGA No. 015SPU – 4/2019

References

Bartoň L., Teslík V., Zahrádková R., Bureš D. (2003): Growth, feed efficiency and carcass characteristics of Czech Pied and Holstein bulls. Czech Journal of Animal Science, 48. 11. 459–465.

Bjelka M., Homola M. (2006): Low input systémy chovu skotu pro využití v LFA ČR, Šetrné čerpání přírodních zdrojů a údržba krajiny pomocí krav bez tržní produkce mléka, Rapotín, 104–120.

Bujko J., Candrák J., Strapák P., Žitný J., Hrnčár C., Koristek J. (2019): Evaluation the Birth Weight of Calves in Selected Herds of Slovak Spotted Cattle. Scientific Papers: Animal Science and Biotechnologies, 52. 1. 48–51.

Crosson P. (2015): How to economically achieve a 365-day calving interval for suckler cows. [online]. Available at: www.agriland.ie/farming-news/how-to-economically-achieve-a-365-day-calving-interval-for-suckler-cows-teagasc/. [Accessed: 2019, November 10].

Cushman R. A., Allan M. F., Thallman R. M., Cunduff L. V. (2007): Characterization of biological types of cattle (Cycle VII): Influence of postpartum interval and oestrus cycle length on fertility. Animal growth, physiology, and reproduction, Journal of Animal Science, 85, 2156–2162.

Golda J., Říha J., Vrchlabský J., Vaněk D., Lehar R. (2000): Extensive cattle production and improvement, ACHMP and VÚCHS Rapotín, 119.

Gregory K. E., Cundiff L. V., Koch R. M. (1991): Breed effects and heterosis in advanced generations of composite population for birth weight, birth date, dystocia and survival as traits of dam in beef cattle. Journal of Animal Science, 69. 9. 3574–3589.

Griffin W. (2011): The effect of calving season and wintering system on cow and calf performance and economics from conception through finishing and the effect of supplementing dried distillers grains to calves in forage based systems: Theses and Dissertations, University of Lincoln – Nebraska, 34-70.

Ćirić J., Lukić M., Radulović S., Janjić J., Glamočlija N., Marković R., Baltić M.Ž. (2017): The relationship between the carcass characteristics and meat composition of young Simmental beef cattle. IOP Conference Series Earth and Environmental Science, 85. 1. 012061, 6.

Mackinnon M.J., Taylor J. F., Hetze D.J.S. (1990): Genetic variation and covariation in beef cow and bull fertility. Journal of Animal Science, 68. 1208–1214.

Olšanská B., Candrák J. (2018): The analysis of factors affecting the calving difficulty in Slovak Spotted cattle. Acta fytotechnica et zootechnica, 21. 3. 119–124.

Szabó F. (1998): Húsmarhstenyésztés, Mezőgazda Kiadó, Budapest, 375.

Szabó F., Nagy L., Dákay I., Márton D., Török M., Bene S.Z. (2006): Effects of breed age of dam birth year, birth season and sex on weaning weight of beef calves. Livestock Science, 103. 1-2. 181–185.

Strapák P., Vavrišínová K., Candrák J., Bulla J. (2000): Calving ease and birth weight of calves of Slovak Simmental cows. Czech Journal of Animal Science, 45. 7. 293–299.

Titterington F. M., Morisson S. J., Lively F. O., Wylie A. R. G., Gordon A. W., Browne M. R. (2015): An analysis of Northern Ireland farmers´experiences of using a target driven beef heifer growth management plan and development of an empirical model leading to the launch of a decision support tool to promote first calving of beef heifers at 24 months. Agricultural Systems, 132. 107–120.

Zahrádková R., Bartoň L., Brychta J., Bureš D. (2009): Masný skot od A po Z, ČSCHMS Praha, 397.

10.17205/SZIE.AWETH.2020.1.029