

THE EFFECT OF PARAGENETIC FACTORS ON BODY DEVELOPMENT OF SIMMENTAL BULL DAMS **

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**Originalni naučni rad-Original scientific paper

Abstract: Body development and type are very important indices of production ability of cows, their capacity to consume sufficient quantity of food, produce technologically high quality milk, reduce the energy consumption in production of milk, remain in exploitation as long as possible and give more progeny. This research included 278 cows of Simmental breed selected into the category of bull dams on the territory of Republic of Serbia.

By application of method of least squares following average values of exterior measures were obtained: height to withers 136,04 cm; carcass length 165,81 cm; breast depth 73,61 cm; breast girth 201,12 cm; body mass 695,29 kg. Regions influenced statistically highly significantly all investigated exterior traits ($P < 0,01$). Year of measuring had no statistically significant effect ($P > 0,05$) on body development of Simmental bull dams. Obtained values were considerably uniform without any greater oscillations.

Key words: Simmental breed, bull dams, exterior, paragenetic factors

Introduction and literature review

There is certain relation between body development of head of cattle and milk production capacity. However, functionality manifested in milk production can not be defined by exterior of cows e.g. their body development. Therefore, capacity of cows for milk production can be precisely determined only by direct measuring of production.

Nenadović et al. (1987) have carried out investigation of milk production on PD »Krivaja« and at the same time also body measuring of 203 Simmental cows and established following average values: height to withers 134 cm, breast girth 212 cm and body mass 704 kg. In the monograph »Simmental cattle in Serbia«, *Romčević (1999)* stated following exterior

measures of Simmental bull dams in years 1995 and 1996: height to withers in both years was the same 136 cm, breast girth 199 and 202 cm, and body mass 697 and 692 kg.

Institute of science application in agriculture (2001), in their annual report on executed livestock selection measures in Serbia in year 2000 published following data on average exterior measures of 565 selected Simmental bull dams: height to withers 136 cm, breast depth 74 cm, carcass length 169 cm, breast girth 199 cm, and body mass 666 kg.

In annual expert report on executed coordination activities in 2007, *Institute for Animal Husbandry (2008)* established following average values of exterior measures in 339 selected Simmental bull dams: height to withers 138,96 cm, breast depth 76,31 cm, carcass length 170,09 cm, breast girth 197,38 cm, and body mass 687,58 kg.

Breeding region can be major environment factor influencing the body development of the head of cattle. The effect of breeding region includes many factors which complement each other, but most important is the nutrition (*Pantelić 2004*). In the research related to variability of the linear evaluation of the type, *Pantelić et al. (2007)* established highly significant effect of breeding region on evaluation of type based on evaluation of the height to withers, carcass length, breast depth and width of hip and pelvis. The effect of year of measuring was statistically significant ($P < 0,05$).

Material and methods

This research included 278 cows of Simmental breed selected categorized as bull dams on the territory of Republic of Serbia. Cows were selected into the herd of bull dams after completion of the first lactation, e.g. based on subsequent lactations. Distribution of bull dams was done according to 7 regions, i.e. breeding regions and 9 groups according to the year of measuring and evaluation.

Breeding regions and number of selected bull dams in these regions were following:

1. Belgrade (municipality of Mladenovac) – 22
2. Podunavlje region (municipality of Smederevska Palanka) – 88
3. Braničevo region (municipality of Požarevac) – 41
4. Timok region (municipality of Zaječar) – 24
5. Kolubara region (municipality of Valjevo) – 55
6. Pomoravlje-Rasina region (municipalities of Jagodina, Kraljevo and Kruševac) – 32
7. Zlatibor region (municipality of Užice) – 16

Investigations included following exterior measures: height to withers, breast depth, breast girth and body mass. Analysis of the effect of paragenetic factors on investigated linear type evaluations was one using method of least squares, fixed model:

$$Y_{ijl} = \mu + R_i + G_j + e_{ijl}$$

Where:

Y_{ijl} = Demonstration of investigated trait in l cow, which produced in i region, measured in j year

μ = general average

R_i = fixed effect of i region

G_j = fixed effect of j year of measuring

e_{ijl} = random error

Results and discussion

By application of method of least squares average values of exterior measures were obtained for Simmental bull dams: height to withers 136,04 cm; carcass length 165,81 cm; breast depth 73,61 cm; breast girth 201,12 cm; body mass 695,29 kg. Visual evaluation of the body development and recognition of cow characteristics which are preliminary milk yielding indicators and partially also indicators of longevity and reproduction abilities of the heads of cattle, which is very important from the aspect of economical efficiency of milk production (*Pantelić et al. 2007*).

Regions had statistically significant effect on investigated exterior traits ($P < 0,01$). The tallest cows were measured on the territory of municipality of Mladenovac 138,22 cm, whereas the smallest cows were measured on the territory of municipality of 134,31 cm. Variation interval of carcass length was from 163,10 cm (Podunavlje region) to 170,57 cm (Belgrade region). Breeding region had highly significant effect on breast depth, where variation interval established was from 70,28 cm in Podunavlje region to 77,37 cm in Pomoravlje-Rasina region. The highest value of breast girth was determined in bull dams from the territory of municipality of Požarevac 207,52 cm, and the lowest heads from the territory of municipality of Smederevska Palanka 197,12 cm. The effect of region was highly significant also on body mass. The greatest body mass was established in heads reared Braničevo region 757,72 kg and the lowest in Pomoravlje-Rasina region 672,47 kg.

Table 1. General average, mean values of least squares and their errors, and significance of the effect of breeding region on exterior measures

Regions	Height to withers	Sism	Carcass length	Sism	Breast depth	Sism	Breast girth	Sism	Body mass	Sism
General average	136.04		165.81		73.61		201.12		695.29	
1.	138.22	0.43	170.57	1.39	73.27	0.81	205.79	1.82	711.87	14.87
2.	135.39	0.31	163.1	0.97	70.28	0.57	197.12	1.26	678.57	10.51
3.	136.71	0.34	165	1.07	74.74	0.63	207.52	1.46	757.72	10.7
4.	135.84	0.45	163.95	1.41	72.61	0.83	201.26	1.83	681.69	14.43
5.	136.41	0.43	165.21	1.34	74.04	0.78	200.2	1.71	678.94	9.28
6.	135.4	0.42	166.16	1.54	77.37	0.77	197.8	1.69	672.47	12.76
7.	134.31	0.55	166.68	1.72	72.95	1.01	198.14	2.21	685.8	18.17
F-test	ftab=8,821**		ftab=4,283**		ftab=12,632**		ftab=8,716**		ftab=7,454**	

N.S – P > 0.05; * - P < 0.05; ** - P < 0.01

Identical results in regard to height to withers and breast depth are presented by the *Institute of science application in agriculture (2001)*, *Pantelić et al. (2006)* and *Romčević (1999)*. Slightly lower values are presented in the research by *Nenadović et al. (1987)*, and higher values in report by *Institute for Animal Husbandry (2008)*. Breeding objective in Switzerland for Simmental cattle breed, except milk and meat production, includes also certain requirements in relation to body measures (*Germann, E. and Pradervand, J.M 2001*). Breeding objective is that cows have height to withers from 138 to 146 cm, with body mass from 650-800 kg. Slightly higher values in regard to carcass length can be found in the annual report »Selection of livestock in Serbia« by the *Institute of Science Application in Agriculture (2001)*. Very close values for body mass were reported by *Romčević (1999)*.

Year of measuring had no statistically significant effect ($P > 0.05$) on body development of Simmental bull dams. Obtained values were uniform, without any greater oscillations.

Body development and type are very important indices of production ability of cows, their capacity to consume sufficient quantity of food, produce technologically high quality milk, reduce the energy consumption in production of milk, remain in exploitation as long as possible and give more progeny (*Pantelić et al. 2005*).

Table 2. General average, mean values of least squares and their errors, and significance of the effect of year of measuring on exterior measures

Year	Height to withers	Slsm	Carcass length	Slsm	Breast depth	Slsm	Breast girth	Slsm
General average	136.04		165.81		73.61		201.12	
1.	134.89	0.83	165.05	2.57	72.45	1.52	200.13	3.31
2.	136.19	0.72	164.49	2.24	75.47	1.32	200.72	2.88
3.	135.85	0.53	165.13	1.65	73.17	0.97	199.09	2.19
4.	135.79	0.66	164.42	2.03	74.28	1.2	205.79	2.61
5.	136.07	0.48	165.32	1.49	72.47	0.88	199.02	1.95
6.	136.05	0.38	165.64	1.16	72.55	0.69	198.4	1.5
7.	136.75	0.27	167.12	0.89	74.19	0.5	200.73	1.12
8.	136.33	0.25	168.76	0.81	73.81	0.47	201.25	1.03
9.	136.44	0.37	166.37	1.19	74.09	0.68	204.95	1.49
F-test	ftab= 1,024ns		ftab= 1,493 ns		ftab= 1,236 ns		ftab= 1,834ns	

N.S - $P > 0.05$; * - $P < 0.05$; ** - $P < 0.01$

Conclusion

Evaluation of the exterior is executed based on knowledge of body development and function of certain organs, as well as most important relations between certain parts of the body. Phenotype correlation between form and production characteristics are positive but relatively low, therefore it is not possible to carry out selection in production sense based on exterior appearance of heads of cattle. Considering the exterior of progeny and their adequate selection, it is possible to reduce significantly the possibility of transfer of negative traits which can be carried by parents as recessive, and which can be spread very quickly in the population by wide use of practice of artificial insemination. Also, exterior traits related to secondary characteristics such as longevity and calving ease have increasingly important role in breeding-selection programs in cattle production.

By application of the method of least squares the following average values of exterior measures in Simmental bull dams: height to withers 136,04 cm; carcass length 165,81 cm; breast depth 73,61 cm; breast girth 201,12 cm; body mass 695,29kg. Regions had statistically significant effect on all

investigated exterior traits ($P < 0,01$). Year of measuring had no statistically significant effect ($P > 0,05$) on body development of Simmental bull dams. Obtained values were uniform, without any greater oscillations.

UTICAJ PARAGENETSKIH FAKTORA NA TELESNU RAZVIJENOST BIKOVSKIH MAJKI SIMENTALSKE RASE

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Rezime

Telesna razvijenost i tip su veoma važni pokazatelji proizvodnih sposobnosti krava, njihovih mogućnosti da konzumiraju dovoljne količine hrane, daju tehnološki kvalitetno mleko, smanje utrošak energije u proizvodnji i što duže ostanu u proizvodnji i daju veći broj potomaka. Ovim istraživanjem je obuhvaćeno 278 krava simentalske rase odabrane u kategoriju bikovskih majki na području Republike Srbije.

Primenom metoda najmanjih kvadrata dobijene su prosečne vrednosti eksterijernih mera: visina grebena 136,04 cm; dužina trupa 165,81 cm; dubina grudi 73,61 cm; obim grudi 201,12 cm; telesna masa 695,29 kg. Regioni su statistički vrlo značajno uticali na sve ispitivane eksterijerne osobine ($P < 0,01$). Godina merenja nije statistički značajno uticala ($P > 0,05$) na telesnu razvijenost bikovskih majki simentalske rase. Dobijene vrednosti bile su dosta ujednačene bez nekih većih oscilacija.

Ključne reči: simentalska rasa, bikovske majke, eksterijer, paragenetski uticaji.

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