



[DOI: 10.22620/agrisci.2021.28.009](https://doi.org/10.22620/agrisci.2021.28.009)

## CHANGE IN THE TYPE OF BODY CONSTRUCTION OF THE BULGARIAN GRAY CATTLE REARED IN THE HERD OF THE SCIENTIFIC CENTRE OF AGRICULTURE - SREDETS

Nikola Chatalbashev<sup>1</sup>, Yanko Gorinov<sup>2</sup>

Agricultural University - Plovdiv<sup>1</sup>, Institute of Animal Science - Kostinbrod<sup>2</sup>

### Abstract

A phenotype evaluation of the change in the body construction of the autochthonous Bulgarian Gray Cattle Breed reared in 'Strandzha' breeding region was carried out in the herd of SCA- Sredets. 10 exterior measurements and 8 body construction indexes were assessed as an element of the process of biodiversity preservation. The study was conducted on the basis of 34 full records of adult cows. The measurements of the animals were taken in 2004 and 2019 upon their bonitization. The experimental data were processed via ANOVA single factor in the medium of the SPSS program product. The exterior measurements of the controlled animals are close to those of the breed updated standard. The fully mature cows of the modern population of the herd have a wither height of  $120.8 \pm 2.02$  cm, athwart body length of  $144.6 \pm 2.42$  cm, chest girth of  $168.3 \pm 2.07$  cm and cannon bone girth of  $16.3 \pm 0.15$  cm. The changes within the population over a 15-year breeding period have indicated light-weighting of the type, and chest parameters which have become lower ( $0.05 > P < 0.01$ ). The cows from the modern population have lower values regarding the chest (5.14%) and the pelvic-chest indexes (8.97%) which leads to a lower body massiveness (-7.21%) ( $P < 0.05$ ).

**Key words:** autochthonous breeds, Bulgarian Grey Cattle Breed, exterior, body construction indexes, dynamics

### INTRODUCTION

The Bulgarian Gray Cattle is an old primitive Bulgarian breed. According to the historical records it originated from the ure (*Bos primigenius*) which used to inhabit our lands until the end of the XVI century in its wild state. The archaeological finds show that one of the domestication centres of the ure in the South-East Europe was located namely on our territory. The local grey cattle has descended from the crossing of the Short-horn (*Bos taurus brachyceros*) and the Long-horn (*Bos taurus primigenius*) cattle. The breed formed has a combined productivity- it is used for work, meat and milk. The size of the animals is medium, they have compact and strong bone system, powerful muscles fit for

work and strong tendons. The Bulgarian Gray Cattle breed is rich in biological and commercial qualities such as tough body construction, high adaptability to environmental conditions, good fertility resulting from the ease of giving birth, lack of any post-natal uterus inflammations, and a remarkable longevity. (Gorinov, 2012).

Currently, the conservation of the Bulgarian Grey Cattle breed is performed through a purposeful breeding system. The selection approach is stabilizing, aimed at preserving the entire existing variability (FAO, 2007). Due to the influence of the agri-environmental specificity of the different regions and the distorted breeding structure, several groups of animals from the Bulgarian



Grey Cattle breed have been distinguished in the last 50 years. (Gorinov, 2012; Platikanov, 1934/35; Savov and Totev 1954; Hadzhidimitrov. 1945/46). These groups differ from each other in type and body structure. The phenotype characteristic of the Bulgarian Grey Cattle breed under the basic exterior indexes is a mandatory prerequisite in the process of building and establishing the modern breeding structure of the breed (Gorinov and Yotov, 2009; Gorinov, 2012, Gorinov nad Lidzhi, 2013). The breed identity has been best preserved in Strandzha breeding region with a main breeding herd in the National Centre of Agriculture (NCA)-Sredets. This herd which is property of the Agricultural Academy, is subjected to purposeful monitoring, and the registration and the control of the animals comprises more than 5 generations.

The aim of the present study is to evaluate the changes in the type of body structure of the Bulgarian Grey Cattle breed in 'Strandzha' breeding region, herd of NCA-Sredets, Drachevo in the process of recovery of the breeding structure.

#### **MATERIALS AND METHODS**

The study involves 34 adult cows (Instruction, 2003) of the Bulgarian Grey Cattle breed, reared in the herd of NCA-Sredets, Drachevo. The animal measurements were taken in 2004 and 2019 upon their bonitization (Studbook, 2019). A statistical analysis of the results after the performance of 10 exterior measurements has been conducted.

The change of the type and body structure of the animals in a herd over a period of 15 years has been examined on the basis of

exterior profiles and biometric processing of data regarding 8 body structure indexes. A comparative analysis of the exterior measurements of adult cows from search activities during 2003-2004 and the own reproduction of the herd- 2019 was carried out.

The experimental data are statistically processed via analysis of variance in the medium of SPSS program product.

#### **RESULTS AND DISCUSSION**

Table 1 displays the total average values of the examined parameters, standard deviations and determination coefficients which demonstrate the phenotype features of the Bulgarian Grey Cattle breed animals from a herd of NCA- Sredets, Drachevo, which are part of the study.

According to the updated breed standard (Gorinov, 2012), the average wither height of adult cows is  $119.4 \pm 2.2$  cm, the body length-  $145.5 \pm 3.5$  cm. The depth, width and girth of the chest are respectively  $62.0 \pm 1.8$ ,  $38.7 \pm 2.1$ ,  $172.0 \pm 4.4$ , and the measurements of the croup width at the seated heights and length are respectively  $46.0 \pm 0.6$  and  $47.0 \pm 0.7$  cm.

The exterior measurements of the animals included in the survey are close to the those of the updated breed standard. The differences in the measurements are negligible and statistically unproved. The difference in the main parameters- wither height, body length, chest girth and cannon-bone girth deviate from the standard with respectively + 1.53%, + 0.50%, +0.69 %, - 2.53%.



Table 1. Exterior measurements- total average, standard deviations, correlation coefficient and  $R^2$  of adult cows of the Bulgarian Grey Cattle breed taken upon search activities (2004) and own reproduction (2019), cm

Parameters	n	LS-means	S.D.	Correlation coefficient	$R^2$
Wither height	34	121.23	3.53	0.047	0.002
Sacrum height	34	126.18	4.85	0.057	0.003
Seat bones height	34	111.84	3.18	0.141	0.020
Athwart body length	34	146.23	5.98	0.197	0.039
Chest depth	34	61.84	4.71	0.084	0.007
Chest width	34	37.75	4.59	0.308	0.095
Chest girth	34	173.19	11.29	0.199	0.040
Croup length	34	48.11	1.91	0.185	0.344
Croup width	34	48.16	2.17	0.121	0.015
Cannon bone girth	34	16.57	0.78	0.344	0.118

Table 2. Exterior measurements of adult cows of the Bulgarian Grey Cattle breed, search activities (2004) and own reproduction of the herd (2019), cm ( $\bar{x} \pm S_x$ )

Exterior measurements	Search activities 2004	Own reproduction 2019
	$\bar{x} \pm S_x$	$\bar{x} \pm S_x$
	n = 15	n = 19
Wither height	121.6 $\pm$ 1.98	120.8 $\pm$ 2.02
Sacrum height	124.7 $\pm$ 1.86	127.6 $\pm$ 1.79
Seat bones height	111.7 $\pm$ 1.22	112.0 $\pm$ 1.11
Athwart body length	147.8 $\pm$ 2.51	144.6 $\pm$ 2.42
Chest depth	63.5 $\pm$ 1.03*	60.2 $\pm$ 1.01
Chest width	40.4 $\pm$ 0.87**	35.1 $\pm$ 0.84
Chest girth	177.6 $\pm$ 1.79**	168.3 $\pm$ 2.07
Croup length	47.6 $\pm$ 1.21	48.6 $\pm$ 1.19
Croup width	48.9 $\pm$ 1.32	47.5 $\pm$ 1.36
Cannon bone girth	16.9 $\pm$ 0.16	16.3 $\pm$ 0.15

\*\* -  $P < 0.01$ ; \* -  $P < 0.05$ ; n.s. -  $P > 0.05$ .

Table 2 displays the dynamics of the exterior parameters of the studied population over a 15-year breeding period. The animals involved in the breeding process during 2004 are phenotypically specified as Bulgarian Grey Cattle. Upon deepening of the herd breeding activities, it was ascertained that part of the

animals were actually crossbred with meat breeds and Bulgarian Brown Cattle. The introduction of purposeful breeding process in the herd led to the elimination of the non-typical animals and stabilization of the heredity. The exterior parameters got closer to those of the updated breed standard elaborated



in 2007 in the conditions of a scientific-research project, funded by the National Center for Agrarian Science (Gorinov et al., 2007).

The modern cows exhibit lower values of the wither height but higher ones regarding the sacrum height (table 2) which leads to increase in the elongation.

Slightly lower are the values of the body length- 3.2cm which, when taking almost the same wither height- 0.8cm into account, results in a decrease in the stretching index with 1.72%.

The most considerable difference is observed with reference to the chest. It is narrower ( $P < 0.01$ ), shallower ( $P < 0.05$ ) and the girth as a whole is smaller ( $P < 0.01$ ). The linear contrast of the chest width, depth and girth

parameters of the animals from the search activities is respectively +3.32cm, +5.32cm and +9.34cm.

The croup parameters of the modern population do not differ considerably from those upon search activities- the length is negligibly bigger and the width- smaller, however, these differences are within the statistical error possibility. The difference in the cannon bone girth is also similar. Generally, the lower values of the chest parameters, the narrower croup and the smaller cannon bone girth are all indicative of the weakening of the animals. This is also proven by the adult cows body structure indexes shown in table 3.

Table 3. Adult cows of the Bulgarian Grey Cattle breed body construction indexes, search activities (2004) and own reproduction of the herd (2019), cm ( $\bar{x} \pm S_x$ )

Body Construction Indexes	Search activities, 2004 $\bar{x} \pm S_x$	Own reproduction, 2019 г. $\bar{x} \pm S_x$
	n = 15	n = 19
Leg length %	47.81±0.48	50.24±0.46
Extension, %	121.49±0.81	119.77±0.97
Chest index, %	63.64±0.79	58.50±0.86
Pelvis-chest index, %	82.89±0.91*	73.91±0.98
Body compactness, %	120.16±0.83	116.04±0.96
Body mass %	102.58±0.25	105.61±0.23
Body massiveness %	145.98±0.60*	138.77±0.69
Bone system development, %	13.86±0.36	13.47±0.34

\* -  $P < 0.05$ ; n.s. -  $P > 0.05$ .

The animals of the modern population have 2.34% longer legs and 5.14% and 8.97% ( $P < 0.05$ ) lower values of respectively the chest and pelvis chest indexes. The low exterior measurements of the chest lead to a lower body massiveness (-7.21%) which is proven at

( $P < 0.05$ ). The decrease of these values results from the breeding activities performed and the exclusion from breeding of all crossbred animals. This lighter body type is formed due to the use of sires which are evaluated



according to their body structure and morphological parameters.

### CONCLUSION

1. The exterior measurements of the cows of the NCA- Sredets, Drachevo herd are close to those in the updated standard for the breed. The differences in the measurements taken are negligible and statistically unproven.

2. The adult cows of the modern population of the herd have wither height of  $120.8 \pm 2.02$  cm, body length of  $144.6 \pm 2.42$  cm, chest girth-  $168.3 \pm 2.07$  cm and cannon bone girth-  $163 \pm 0.15$  cm.

3. The changes in the population over a 15-year breeding period indicate lightening of the type and lowering of the chest parameters ( $0.05 > P < 0.01$ ). The cows from the modern population have lower chest (5.14%) and pelvis chest (8.97%) indexes which leads to a lowered body massiveness ( $-7.21\%$ ) ( $P < 0.05$ ).

### REFERENCES

- Gorinov, Y., 2012, Breeding activities in the process of setting up the organizational structure of the Bulgarian Grey Cattle Breed, Second and revised edition, Local cattle breeding association, NIBA consult, pg 9-52. ISBN-978-954-451-032-9, Sofia.
- Gorinov Y., B. Yotov; 2009. Exterior features of cows of the Bulgarian Grey Cattle breed. *Journal of Mountain Agriculture on the Balkans*, 1, 13-23.
- Gorinov Y., K. Lidji, B. Yotov, N. Palova; 2007. Preservation of the genetic heredity of the autochthonous population of Bulgarian gray cattle. Development of a breeding program. NCAN, 34 p.
- Gorinov, Y., K. Lidzhi, 2013. Measurements and proportions of the body of the Bulgarian Grey Cattle breed. *Journal of*

*Mountain Agriculture on the Balkans*, 5: 1069-1078.

Instructions for performance of breeding activities upon conservation of aboriginal (autochthonous) breeds in Bulgaria. 2003. MAFF, EASRSF, ISBN-945-98887-42-1, Sofia

Platikanov, N. 1934/35. Contribution to the growth and development of the Bulgarian Grey Cattle Breed.

Bulgarian Grey Cattle Breed Studbook, 2019.

Savov T., St. D. Totev, 1954. Breed distribution of cattle, sheep and pigs in Bulgaria. Edited by acad, G. S. Hlebarov, Sofia, BAS, pg. 27-66.

Hadzhidimitrov P., 1945/46. Body form and build of cows of the breeding region of the Bulgarian Grey Cattle Breed.

FAO, 2007. Global Plan of Action for Animal Genetic Resources and the Interlaken Declaration, Rome, 37 p.