# EXTERIOR EXAMINATION OF 'LIMOUSIN' COWS REARED IN THE CENTRAL GEOGRAPHICAL REGION OF BULGARIA

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*Abstract*

*A characteristic of the external features of 'Limousin', reared in the Central Geographical Region of Bulgaria is presented. The breed is specialized in beef production. External measurements and body mass indices of 'Limousin' cows reared in herds in the area of vicinity the town of Troyan, Central Bulgaria were made. External dimensions of offspring of cows born in Bulgaria and Hungary were taken. The study was conducted on 50 first-calf heifers raised on 3 different farms for the period 2019-2021. The removal of the external dimensions took place during spring calving, 100-150 days after birth. The country of birth of cows had a significant impact on the rump height at the sacrum and sciatic bones and chest depth of their offspring (P <0.001). Differences in wither height, athwart body length, and cannon circumference were demonstrated in (P <0.05). The cows of offspring born in Hungary were 2.5 cm higher at the withers than those born in Bulgaria, and the difference in chest depth reached 8.3 cm. Pronounced body superstructure was observed in cows, descendants of cows born in Hungary.*

*Key words: development, exterior measurements, index, 'Limousin', origin.*

## INTRODUCTION

The new economic and dietary requirements for the quality of beef cattle breeds predispose to the breeding of large-sized animals, with high live weight and intensive growth of muscle tissue, and low fat deposition. 'Limousin' breed is characterized by good meat productivity and adaptation indicators (Baharev et al., 2017; Caranfilov et al., 2019).
In the selection of animals, the exterior selection is especially important, the so called phenotypic expression selection. Only the proper physiological development of cattle allows a representative, under good feeding and breeding conditions, to show its best genetic potential for productivity (Soldatov et al., 1988; Kayumov, 2006; Chikalev and Yuldbasheva, 2012; Ivanov and Volkina, 2017).
Cattle of beef breeds are distinguished by their compact constitution, wide back, wide and deep chest, thick neck and small, harmoniously located head. Withers are low and wide. The linear evaluation by external forms is directly related to the realized productivity (Panayotova, 2011; Gergovska and Panayotova, 2016; Alekseeva et al., 2017).

The rate of genetic improvement in cattle breeds is closely dependent on the hereditary value of individuals (Byrne et al., 2015, Gorinov and Lidji, 2016). Linear measurements and the exterior have been shown to be related to the reproductive abilities and longevity of cattle species (Usenko et al., 2004; Zink et al., 2019; Karamfilov, 2020).
The objective of the present study is the exterior features of first-calf cows of 'Limousin' breed, which are offspring of animals born in Bulgaria and Hungary, raised in the Central Geographical Region, on farms near the town of Troyan.

## MATERIALS AND METHODS

The study was conducted on 50 first-calf cows raised on three different farms located in the Central Geographical Region, located in the vicinity of the town of Troyan, in the period 2019-2021. The technological conditions in these farms are similar. During the period April-November pasture cultivation was applied, and rearing in a cowshed during the rest of the year. The study included young female animals, offspring of cows born in Bulgaria and Hungary.

The following zootechnical instruments were used: Lidtin's stick, Wilkens' compasses, a measuring tape, a retractable tape measure and forms for writing.

The exterior measurements were taken during the spring calving, 100-150 days after delivery. During the measurement, the cows were placed (fixed) in a metal frame, observing all zootechnical requirements for taking measurements. To increase the objectivity of the external assessment, according to the methodology of Nozhchev et al. (1983), the following measurements were taken**:** height at the withers, height at the sacrum, chest depth, chest width, chest girth, body length, cannon bone girth, rump width behind hips, rump width at ischial tuberosities. The live weight of the animals was weighed by an electronic scale. The measurements were compared with some of the standard indicators published in the selection program of the breed for the studied age and category.

The data were entered, coded and analyzed, biometrically by the methods of variation statistics in MS Excel with the help of R statistical software, version 3.5.2, and presented in tables.

**RESULTS AND DISCUSSIONS**

The assessment of the external characteristics of the studied animals is based on the measurement of the respective external indicators according to the generally accepted methodology. The results are presented in Table 1.

The exterior characteristics of first-calf cows for several generations show the dynamics of changes in the general proportions of their physical development during the change of generations (Bakharev and Sheveleva, 2017).

Table 1. Measured body indicators of 'Limousin' first-calf cows in cm (x±Sx, Cv%)

| Measurement | (I group) n=25 | (II group) n=25 | Standard (according to Nikolov and Karamfilov, 2021) |
|---|---|---|---|
| | x±Sx | x±Sx | x±Sx |
| Withers height | 129.5±0.82* | 132.0±1.33* | 132.7±2.23 |
| Sacrum height, cm | 134.9±0.32*** | 137.6±0.58*** | 137.5±5.63 |
| Chest depth, cm | 77.3± 2.78 | 85.6±0.52 | 83.7±3.49 |
| Chest width, cm | 43.1±0.24*** | 46.7±0.51*** | 46.3±1.82 |
| Chest girth, cm | 184.3±1.22 | 188.9±1.11 | 189.2±4.71 |
| Athwart body length, cm | 153.7±0.29* | 154.3±0.32* | 154.7±4.18 |
| Cannon bone girth, cm | 18.9±0.23* | 19.1±0.27* | 19.2±0.49 |
| Rump width behind hips, cm | 46.9±0.30 | 49.4±0.25* | 49.6±3.41 |
| Rump width at the ischial tuberosities, cm | 43.8±0.19 | 45.2±0.38 | 45.7±2.58 |
| Live weight, kg | 594.7±3.46 | 612.4±2.03 | 610 |

P<0,05*, P<0,001**, P<0,0001***

First-calf cows, which are offspring of cows born in Hungary (group II), were 2.5 cm or 2.45% higher at the withers than those which were offspring of cows born in Bulgaria (group I), with 2.7 cm or 2.65 % higher at the sacrum, and in terms of chest depth, this difference reached 8.3 cm or 7.49%. Body height as well as body length are directly related to the possibility of achieving higher live weight in beef cattle (Lukuju et al., 2016). The country of delivery in cows had a significant effect on their offspring height on the rump at the sacrum and chest depth (P<0.001). Differences in wither height, athwart body length, and cannon bone girth were demonstrated at (P <0.05).

When comparing the measurements with the standard indicators of the breed we can note that the average indicators of both studied groups correspond to the set standard, and closer to it are the animals, which are offspring of those born in Hungary (group II).

Based on the obtained measurements for the evaluation of individual parts of the body, we calculated the body constitution indices of both comparable groups, which are presented in Table 2.

Figure 1. Descendants of cows from Hungary

Table 2. Body constitution indices of first-calf cows of 'Limousin' breed in %

| Body constitution indices | 'Limousin' first-calf cows | |
| --- | --- | --- |
| | (I group) n=25 | (II group) n=25 |
| Body overbuilding index, % | 40.31 | 35.15 |
| Extension index, % | 118.67 | 116.89 |
| Pelvis-chest index, % | 91.90 | 93.73 |
| Chest index, % | 55.76 | 55.32 |
| Compactness index, % | 119.90 | 122.42 |
| Bone growth index, % | 14.59 | 14.46 |
| Overgrowth index, % | 104.17 | 104.24 |
| Pelvic width index, % | 107.08 | 109.29 |
| Meat index, % | 172.8 | 175.2 |

Body constitution index is the ratio of anatomically related measurements, expressed as a percentage. It is calculated according to previously developed formulas (Soldatov et al., 1983, Usenko et al., 2004).

The body overbuilding index shows the relative development of the limbs compared to the body. Significant body overbuilding was observed in cows, which are offspring of cows born in Hungary, with 35.15%. Higher overbuilding, was found in cows, offspring of cows born in Bulgaria, with 40.31%, or a difference of 5.16%. In the exterior assessment it is important to get an idea of the proportional structure of cattle as a whole, as well as the growth and development of individual parts. The size of the measurement allows to compare individual parts of the animal's body, but does not give a complete description of the proportions of the body constitution (Belenkaya, 2016; Gorinov & Lidji, 2016). Extension index characterizes the ratio of the body to its height. In the present case, both values are within the standard of the breed, as higher were the values of the offspring of cows born in Bulgaria (group I) with 118.67%.

Pelvis-chest index shows the development of the front and back of the body. The values shown are higher in cows which are offspring of Hungarian-born cows (group II), by 1.83%.

Chest index gives information about the development of the chest. Here the advantage, although minimal by 0.44%, was for the offspring of cows born in Bulgaria (group I).

The compactness index shows the muscle development. It changes little over time and is an indicator of body development during the postnatal period. The values shown are higher for the cows, which were offspring of first-calf cows born in Hungary (group II), by 2.52%.

The selected indicators for analysis allow to assess the degree of development of cattle, its body proportions and its general constitutional type (Chikalev et al., 2012).

Bone growth index gives information about the development of bone tissue. With increasing age, the value of this index increases. That difference is small and in favor of first-calf cows, offspring of cows born in Bulgaria (group I), in the order of 0.13%.

For the other three calculated indices: the overgrowth index, the pelvic width index and the meat index, again the superiority was for first-calf cows, offspring of cows born in Hungary (group II), by 0.07%, 0.21% and by 2.4%. These differences are relatively minimal and do not show large deviations from the breed standard.

The body constitution indices of both groups of 'Limousin' first-calf cows are generally characteristic of female carnivores.
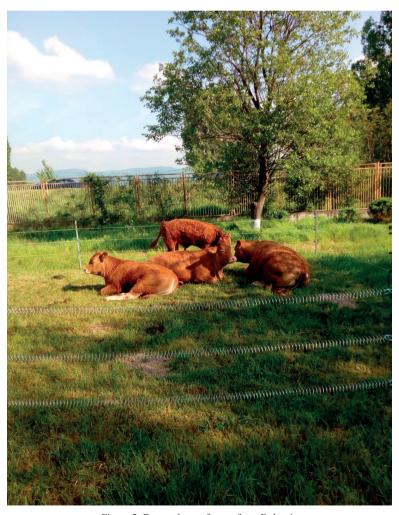


Figure 2. Descendants of cows from Bulgaria

These data are close, and in some cases are supplemented by those obtained by Gorinov and Lidji (2016), Baharev and Sheveleva (2017) and Caranfilov et al. (2019).

## CONCLUSIONS

The adaptation to the climatic conditions of the Central geographical region of Bulgaria, the surroundings of the town of Troyan confirms the development of the indices for typical body constitution and type, which when changing the generation, clearly show the dynamics of growth. The cows, which are offspring of cows born in Hungary, were 2.5 cm higher at the withers than those born in Bulgaria, and the difference in chest depth reached 8.3 cm. Significant body overbuilding was observed in both groups. The calculated indices of body constitution in both studied groups of first-calf cows of 'Limousin' breed are generally characteristic of carnivorous animals.

## ACKNOWLEDGEMENTS

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