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EFFECT OF THE COUNTRY OF ORIGIN ON LINEAR TYPE TRAITS IN ABERDEEN ANGUS COWS

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ABSTRACT

The aim of the present study was to investigate the effects of the country of origin on linear type traits in Aberdeen Angus cows.

A linear type traits assessment was performed with 70 cows from the Aberdeen Angus breed in relation to the country of origin of animals – Bulgaria, Austria, Lithuania, Romania, Czech Republic, Germany and UK.

The evaluation was done on a scale from 1 to 9 (according to instructions of the ICAR, 2018) for general traits as follows: type, muscularity and skeleton. The highest scores for type, musculature and skeleton, were established for cows in Lithuania and the UK. Animals originating from these two countries are distinguished by a wider chest, correct leg set, and good fore udder atachment.

The animals reared in Bulgaria are outlined with high scores, the likely reason for which is that most farms use world-class genetics and are the result of long years of selection.

Key words: *linear type traits, meat cattle, Aberdeen Angus, country*

INTRODUCTION

Contemporary trends of livestock husbandry development imply improvement of existing and creation of new high-production cattle breeds and lines, which can contribute to increasing efficiency and obtaining high-quality products (Kaurivi et al. 2019; Dlamini et al. 2020; Nguyen et al. 2021). Beef cattle breeds are valuable; their breeding includes various factors that may have an effect on their general appearance, reproduction and production performance. Therefore, continuous research, analysis and monitoring of these characteristics are necessary to ensure the best results in breeding and production (Shevchenko et al. 2024).

The US Department of Agriculture forecasts a global increase in beef production by 2.37% in 2024, reaching 61.38 million tonnes, with USA, Brazil and China being the leading producers. The US is the largest producer, followed by Brazil, China, the European Union, India and Argentina.
In both dairy and meat industries, the linear traits describing the skeletal, musculature and functions characteristics of animals are routinely evaluated in live animals (Doyle et al. 2018). Linear descriptive traits of beef cattle are usually evaluated in three main categories: skeleton, musculature and legs (FABA, 2024b).

Berry et al. (2019) reported that the evaluation of linear descriptive traits is done after the animals attain sexual maturity. This evaluation is a valuable tool for predicting other traits which are difficult for measurement or are evaluated after the slaughter, e.g. the carcass traits (Doyle et al. 2020).

The genetic correlations of traits describing the skeletal conformation of an animal with many other traits characterising productivity, including feed conversion, reproductive and carcass traits are moderate to strong (Bouquet et al. 2010; Bonfatti et al. 2013; Doyle et al. 2018; Judge et al. 2019). Doyle et al. (2018; 2020), indicated that the traits describing the animal's type can provide useful

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information about the morphological differences between animals that determine the phenotypic differences. Selection aimed at improving beef quality is often based mainly on growth performance and *in vivo* conformation (Albera et al. 2001; Sbarra et al. 2013). Alternatively, muscularity traits from routine linear type assessment are used (Mantovani et al. 2010; Frigo et al. 2013), or rather data about quantitative and qualitative carcass traits recorded in slaughterhouses (Bonfatti et al. 2013; Sbarra et al. 2013).

The aim of the present study was to investigate the effects of the country of origin on linear type traits in Aberdeen Angus cows.

MATERIALS AND METHODS

A linear type traits assessment was performed with 70 cows from the Aberdeen Angus breed in relation to the country of origin of animals – Bulgaria, Austria, Lithuania, Romania, Czech Republic, Germany and United Kingdom. Each group included 10 animals born in 2016, reared in different herds but under uniform production system and feeding regimen.

The evaluation was done on a scale from 1 to 9 (according to instructions of the International Committee for Animal Recording ICAR, 2018) for general traits as follows: type (head; neck; front, middle and rear body parts; udder; testes; skin and haircoat colour muscularity (shoulder; back and loin; length and width of thighs), skeleton (body depth and width; backline; rump length and width; front and rear legs set; legs and hooves).

The data about the pedigree and linear descriptive traits measures of animals were provided by the Beef Breeders Association of Bulgaria.

Data were processed by means of Systat 13 and IBM SPSS Statistics 19 software.

RESULTS AND DISCUSSION

The animals included in this study are typical representatives of the breed. Their body is harmoniously developed, possessing the typical morphological features – a smooth transition between the individual parts of the body, without visible flaws. The body is deep and wide when viewed from the side and front, well-muscled in its individual parts, with the abdomen not sagging, but with the capacity for normal development of the internal organs. Their bone system is healthy, with strong joints and tendons. The legs are correctly set, straight in the hock area. The croup is wide at the hip joints, well-muscled, with a moderate slope towards the ischial bones – this is a prerequisite for trouble-free calving. As shown in Table 1, the variation between average scores of the three types of traits was insignificant – 7.714 for type, 7.529 for musculature and 7.657 for skeleton traits. Equal minimum and maximum values were detected for the traits in the studied population. The greatest standard deviation was determined for the musculature scores – 0.503.

Table 1: Descriptive statistics of types of traits depending on the country of origin

Traits	N	Minimum	Maximum	Mean	Std. Deviation
Type	70	7.00	8.00	7.714	0.455
Musculature	70	7.00	8.00	7.529	0.503
Skeleton	70	7.00	8.00	7.657	0.478

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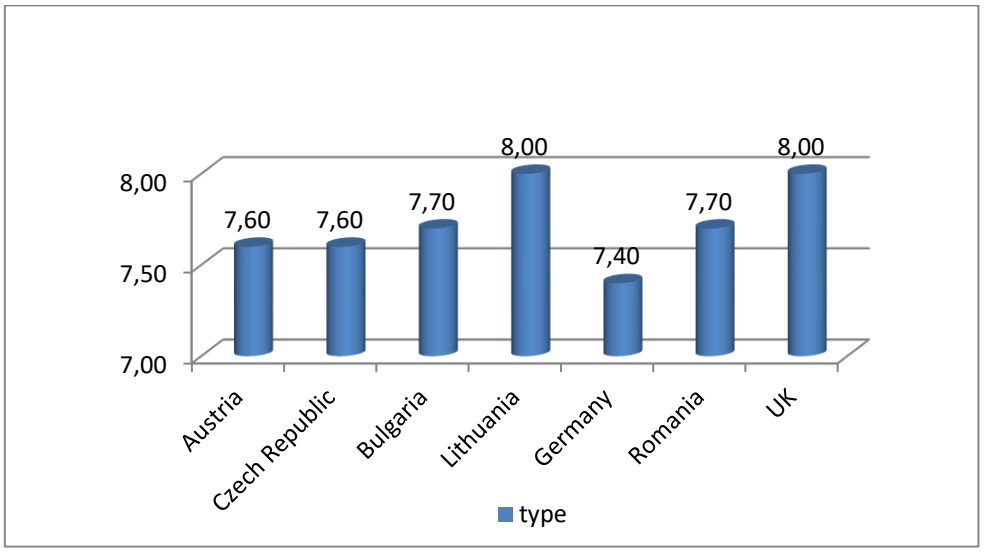

Figure 1: Average score for type of Aberdeen Angus cows depending on the country of origin

The average score for type for Aberdeen Angus cows depending on the country of origin is presented on Fig. 1. The highest scores for type were found in Lithuania and the United Kingdom - 8.00. Animals originating from these two countries were distinguished by a wide chest and high withers, correct legs' set, fine and elastic skin and fore udder atachment. Animals reared in Bulgaria were also outlined with a high score (7.70), probably due to the fact that most of the farms use world-class genetics and that they are the result of many years of selection. The lowest value - 7.40 was recorded for animals originating from Germany.

In the linear traits for musculature and skeleton, the animals raised in Lithuania and the United Kingdom demonstrated again the highest scores - 8.00 and 7.90 for musculature and 8.00 and 7.90 for skeleton, respectively (Fig. 2 and 3). The cows raised in Bulgaria also had well-developed musculature and traits characterizing the skeleton. This is the result from the desire of farmers for a competitive and efficient framing of meat-type animals, distinguished by an excellent general appearance.

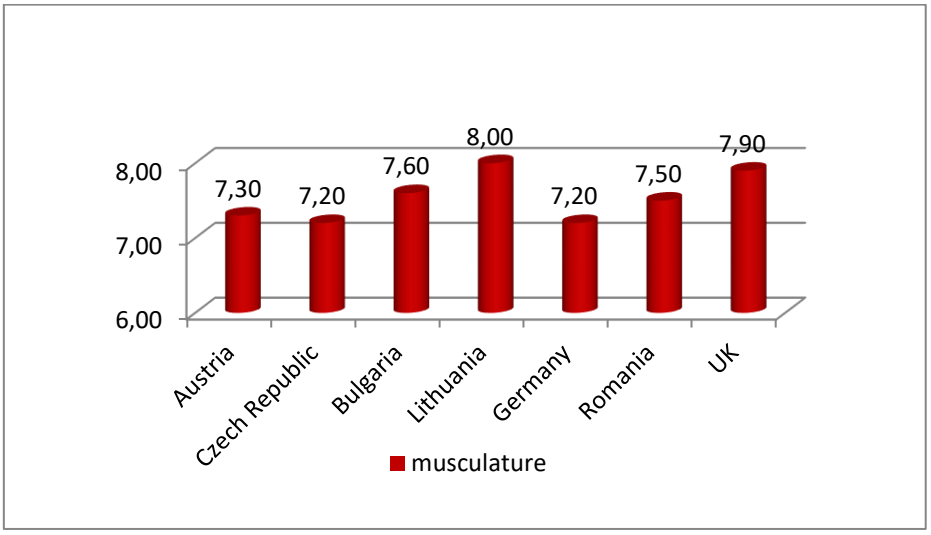

Figure 2: Average score for musculature of Aberdeen Angus cows depending on the country of origin

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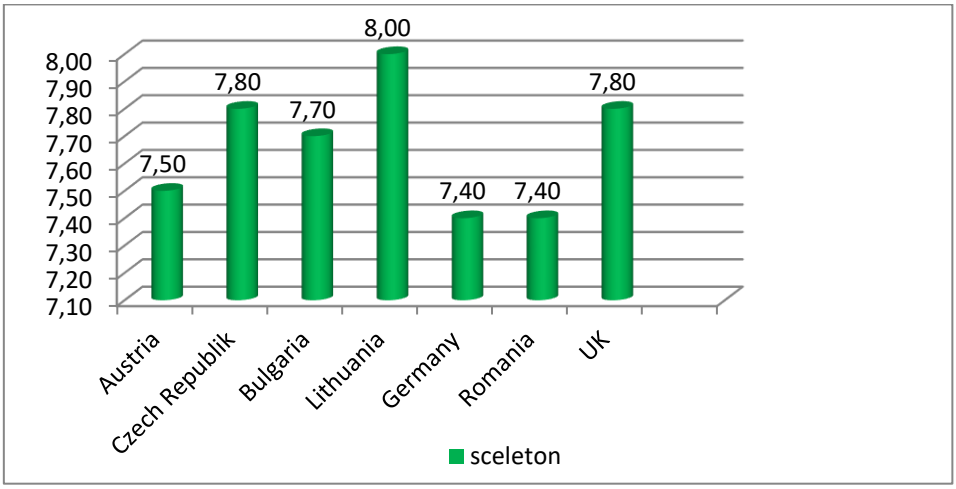

Figure 3: Average score for sceleton of Aberdeen Angus cows depending on the country of origin

Table 2 presents the data for the covariance components and statistical significance levels in relation to the effects of the country of origin on the different traits. A highly significant influence ($p<0.001$) was found between the different countries for the musculature traits, whereas for the other two groups of traits – for type and skeleton, the country of origin had a significant influence ($p<0.001$).

Table 2: F – values and levels of statistical significance of between-group effects on different traits

		Sum of Squares	df	Mean Square	F
Type	Between-group	2.982	6	0.497	2.770**
Musculature	Between-group	6.116	6	1.019	5.669***
Skeleton	Between-group	3.367	6	0.561	2.850**

Table 3 presents the established genetic correlations between the traits. The strongest positive correlation was recorded between the traits for skeleton and type /0.742/. The genetic correlation between the traits for type and musculature and between traits for musculature and skeleton was high and with similar values: 0.543 and 0.524, respectively. The high correlation between traits for type and skeleton is logical, since the individual body parts of animals with a high score for type should have a healthy and well-developed body.

Table 3: Genetic correlations among the studied traits (Pearson correlation).

Traits	Type	Musculature	Skeleton
Type		0.543	0.742
Musculature	0.543		0.524
Skeleton	0.742	0.524	

Our results correspond to those of (Bouquet et al. 2010; Bonfatti et al. 2013 Doyle et al. 2018; Judge et al. 2019). Doyle et al. (2018; 2020), which have found out that the traits describing the skeletal conformation of an animal are moderately to strongly genetically correlated.

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The results of this study show that animals born in Bulgaria are competitive with those produced by foreign selection. It is essential to continue implementing best practices in both feeding and husbandry technologies, as well as in their selection and breeding.

CONCLUSION

1. The highest scores for the three linear traits – for type, musculature and skeleton, were established for cows in Lithuania and the United Kingdom. Animals originating from these two countries are distinguished by a wider chest and greater withers height, correct leg set, fine and elastic skin and good fore udder atachment.
2. The animals reared in Bulgaria are outlined with high scores, the likely reason for which is that most farms use world-class genetics and are the result of long years of selection.
3. The strongest positive correlation was reported between the averaged traits for skeleton and type /0.742/.

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