RESEARCH REGARDING THE FACTORS INFLUENCING MEAT PRODUCTION AT A BOVINE HERD

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Abstract

The present paper proposes a bold approach to a topical issue, namely the production of beef meat. The study was conducted on a herd of 120 Aberdeen Angus cattle. Genetic and exploitative factors that influence meat production have been studied on this biological material.

In conditions, of an extensive exploitation system, the medium value of 1111.16 g for the average daily gain is very good. The limits were between 869 g and 1453 g.

The body weight at 200 days registered an average value of 255.5 kg with limits between 171.8 and 322.6 kg.

Analyzing the results of the descendants by sex factor, we found significant differences in the average daily gain, and the body weight at 200 days, in favour of the males. Thus, the average daily gain was 1060.4 g for females and 1268.2 g for males, the difference being significant with 208 g. The body weight at 200 days evolved accordingly, in favour of males with 50.63 kg respectively, a body weight of 245.46 kg was recorded for females and 296.09 kg for males.

The birth weight is positively and intermediary correlated with the mean daily gain r=0.375 (37%), the link being significant for p<0.01, but also with the index of the average daily gain r=0.315 for p<0.05.

As a conclusion, in the case of the studied herd, we find that both exploitation and genetic factors have positively influenced the results on meat production indicators.

Key words: production, meat, cattle, breed, correlations

INTRODUCTION

The cattle breeding sector for quality meat production has become a very important sector of agriculture in our country, because at the European Union level this quality meat is highly appreciated and sought after [6], [7], [10].

Meat in general and beef meat, in particular, is a social product indispensable for a rational human nutrition, which reflects the standard of life of a nation, respectively the quality of its life [4], [11], [12], [14].

The social significance of the meat results from the high biological value, but also from the fact that it is suitable for processing in the form of a wide range of products and semi-products [1], [2], [5].

In Romania, meat participates in the structure of food availability with 9.6% calories and 14.2% protein [10].

The present paper proposes a bold approach to a topical issue, namely the production of beef meat by breeding and fattening them, as it constitutes a source of profit, intensification and efficiency of agriculture through the superior use of cheap fodder resources, which can be transformed into a product with high biological and nutritional value [8], [9], [13].

MATERIAL AND METHOD

The study was conducted on a herd of 120 Aberdeen Angus cattle, which were purchased from Germany and exploited within the Karpaten Meat Company from Sibiu. Genetic and exploitative factors that influence meat production have been studied on this biological material. The information regarding the origin of the cattle's and their

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performances, were obtained within the company, and the study of the exploitation factors was carried out on the farm. The selection indexes analyzed, which are found on the certificate of origin, were:

RZF - improving value for meat production;

Mat - index for the maternal effect at the age of 200 days;

TZ - index of average daily gain at the age of 365 days;

B - index of muscle mass development at the age of 365 days.

The obtained data were systematized, processed and interpreted by the specific methods of such research. The statistics, respectively the parameters, which characterize a normal distribution, are on the one hand average or median, and on the other hand the dispersion indices represented by variance and the standard deviation of the pursued character. For this purpose, the computer software S.A.V.C. (Statistical Analysis of Variance and Covariance, 2003) to determine the arithmetic mean (X), the error of the arithmetic mean (±s) the standard deviation (s), the coefficient of variation (V%), and for the ANOVA significance tests respectively p and the Pearson correlation, we used the software program SPSS16 [3].

The correlation coefficient (Pearson) is a measure of the linear association between two variables, in other words of the degree to which the bivariate representation in the form of a scattering diagram approaches a straight line. Noting with X and Y the two variables and with x_i, y_i, i = 1, ..., n, the values of the variables, the calculation formula is:

$$r_{XY} = \frac{\sum (x_i - \overline{X})(y_i - \overline{Y})}{\sqrt{\left(\sum (x_i - \overline{X})^2\right)\left(\sum (y_i - \overline{Y})^2\right)}}$$

The correlation coefficient assumes values between –1 and +1, including, with the significance of positive / negative association after the sign of the coefficient and lack of association for rXY = 0. Statistical significance (approximate) is obtained by applying a Student test with statistics:

$t = r_{XY}\sqrt{\frac{n-2}{1-r_{XY}^2}}$, having n-2 degrees of freedom.

-|0 < r < 0.19| - very weak correlation
-|0.20 < r < 0.25| - weak correlation;
-|0.26 <r < 0.40|- moderate correlation;
-|0.41 <r < 0.69| - strong correlation;
-|0.70< r < 1| - very strong correlation.

RESULTS AND DISCUSSIONS

In the “KARPATEN MEAT” farm two breeding systems are harmoniously combined, namely: the extensive system with the intensive system.

In the first months of life, in pre-ruminant phase, the calves are feed with milk, after which they switch to a diet based on volume feeds until the age of 8 to 9 months, when weaning occurs. The advantage of this system is given by the reduced investments and the obtaining of a quality meat, at a low production price. The company’s motto is “less stable and abundant pastures”.

Cow’s maintenance on the pasture takes place throughout the year, on the parcels with an area of 60 to 120 ha. For each mother cow, during the grazing time, an area of 0.4-0.6 ha/day is allocated, conditioned by the productive level of the pasture. On each parcel is provided shade or lonely trees or the edge of a forest.

The second system is practiced for fattening and finishing the calves after weaning. The system is characterized by a high cost of the production process and a high level of labour productivity, which allows the optimization of all technical - economic parameters. At this stage, beef cattle are breed to the age of 17-18 months, when they reach a live weight between 550-650 kg, and at slaughter, the carcass weight is between 320-350 kg.

The fattening and finishing of the calves takes place in semi-open shelters, with common stalls, by age and weight categories, and on the outside are provided with a feeding alley. The bedding is made of straw and is refreshed once or twice a week so that at the end of each fattening series the bedding is mechanically discharged.

The origin of the herd analyzed is valuable (tab. 1).

The birth weight had average values between 31.31 kg for the father's mother (MT) and 35.42 kg for the father's father (TT). The minimum limit was 22 kg for the mother's mother (MM), and the maximum limit of 40 kg for the father's father (TT) and father's mother (TM).

The mean value for the daily mean increase (SMZ) was between 1082.04 g for the mother (M) of the descendants and 1357.04 g for the father of the mother (TM) with the minimum limit of 1009 g and the maximum of 1573 g.

Arithmetic mean of the improvement value for meat (RZF) had values ranging between 95.32 for the mother's mother (MM) and 102.94 for the father's father (TT), which indicates that the transmission of the meat aptitudes from ascendance to descendants is quite good.

Table 1 The statistics of meat production for the ascendance of the studied herd

Ascendance	Characters	no.	X	±s*x*	s	V%	Min.	Max.
T	Birth weight (kg)	90	33.87	0.697	4.679	13.815	28	40
	Average daily gain (g)	90	1298.7	16.363	115.706	8.909	1125	1526
	RZF	90	98.84	2.186	9.352	9.641	92	112
	Mat	90	103.1	0.624	4.409	4.276	91	110
	TZ	90	95.8	2.012	5.228	5.852	89	113
	B	90	100.56	1.022	7.226	7.185	88	111
M	Birth weight (kg)	90	33.51	0.671	4.08	12.174	26	40
	Average daily gain (g)	90	1082.04	20.71	299.663	7.694	1016	1465
	RZF	90	99.04	1.034	7.315	7.386	76	117
	Mat	90	101.06	0.644	4.555	4.508	90	111
	TZ	90	97.52	0.865	6.115	6.271	85	112
	B	90	100.14	1.276	9.022	9.009	74	119
TT	Birth weight (kg)	90	35.42	0.809	4.984	14.072	29	40
	Average daily gain (g)	90	1428.1	18.881	120.9	8.466	1130	1573
	RZF	90	102.94	1.015	7.175	6.97	87	122
	Mat	90	100.9	0.512	3.621	3.589	93	109
	TZ	90	101.58	0.935	6.609	6.506	86	113
	B	90	102.24	1.045	7.392	7.23	81	120
MT	Birth weight (kg)	90	31.31	0.644	3.81	12.167	24	39
	Average daily gain (g)	90	1135.82	27.03	181.32	9.964	1021	1507
	RZF	90	97.74	1.045	7.392	7.563	85	115
	Mat	90	102.5	2.103	6.873	6.51	80	112
	TZ	90	93.4	1.062	7.508	8.038	82	107
	B	90	98.36	1	7.073	7.191	86	113
TM	Birth weight	90	35.05	0.789	4.992	14.243	28	40
	Average daily gain	90	1357.04	21.131	146.401	10.788	1078	1561
	RZF	90	101.14	1.252	8.853	8.753	87	122
	Mat	90	99.96	0.659	4.66	4.662	90	114
	TZ	90	98.74	2.164	7.299	7.495	88	115
	B	90	101.62	1.588	11.232	11.053	75	122
MM	Birth weight (kg)	90	31.5	0.657	3.082	9.785	22	35
	Average daily gain (g)	90	1113.3	27.778	175.681	10.78	1009	1463
	RZF	90	95.32	1.169	8.27	8.676	71	112
	Mat	90	102.9	0.925	6.538	6.354	89	121
	TZ	90	92.76	0.951	6.727	7.252	79	114
	B	90	96.82	1.393	9.849	10.173	65	118

The index for maternal effect at 200 days (Mat) registered average values 99.96 for the mother's father (TM) and 103.1 for descendants father (T). The maximum limit for this index was 121 at the mother's mother (MM). This index represents the cumulative value of several indexes, as follows: the ease calving index, the growth index until age of

weaning, the index of muscle mass development at weaning, and the breastfeeding index. The statistical effect of all these indices is outlined using statistical models. Therefore, the descendants have a good start that will allow optimal development.

The average daily gain index at 365 days (TZ) had average values ranking between 92.76 at mother's mother (MM) and 101.58 at father's father (TT). The maximum limit for this index was 115 at the mother's father (TM). From here, we come to the conclusion that the offspring can record great gains even after a year

Last but not least, the muscle development index of 365 days (B) had very good average values ranging between 96.82 for the mother's mother (MM) and 102.24 for the father's father (TT).

The maximum limit for this index was 122 for the mother's father (TM). The ascendance transmits to the descendants a hereditary basis quite good for the development of the muscle mass at the age of 365 days.

The coefficient of variation (V%) for the analyzed indicators indicates a small variation of 4.5% to an average of 14.24%.

The descent analysis from the "KARAPTEN MEAT" farm was made based on the information from the individual records of the animals. Statistical processing allowed us to systematize the results in the tables 2 and 3.

Table 2 The statistics of meat production for the studied herd

Character	no.	X	$\pm s_x$	s	V%	Min.	Max.
Birth weight, kg	120	33.06	0.543	3.841	11.618	26	42
Average daily gain at 200 days, g	120	1111.16	30.884	118.381	19.653	869	1453
Corporal weight at 200 days, kg	120	255.5	6.142	43.427	16.997	171.8	322.6

From table 2 it results that the descendants had an average birth weight of 33.06 kg with limits between 26 and 42 kg. For this breed it is an optimal body weight and corresponds to the body weight at birth recorded by the ascendancy. In conditions, of an extensive exploitation system, the medium value of 1111.16 g for the average daily gain is very good. The limits were between 869 g and 1453 g.

The body weight at 200 days registered an average value of 255.5 kg with limits between 171.8 and 322.6 kg.

Table 3 The statistics of meat production according to sex for the studied herd

Gender	Character	no.	X	$\pm s_x$	s	V%	Min.	Max.
F.	Birth weight (kg)	60	33.37	0.611	3.347	10.032	27	41
	Average daily gain at 200 days (g)	60	1060.4	42.043	130.281	21.716	869	1453
	Corporal weight at 200 days (kg)	60	245.46	8.3	45.458	18.52	171.8	322.6
M.	Birth weight (kg)	60	36.65	0.674	3.014	8.223	30	44
	Average daily gain at 200 days (g)	60	1268.2	31.2	139.531	11.002	1021	1475
	Corporal weight at 200 days (kg)	60	296.09	4.284	19.161	6.471	271.8	332.2

Analyzing the results of the descendants by sex factor (tab. 3), we found significant differences in the average daily gain, and the body weight at 200 days, in favour of the males.

Thus, the birth weight had an average value of 33.37 kg for females and 36.65 kg for males.

Average daily gain was 1060.4 g for females and 1268.2 g for males, the

difference being significant with 208 g. The body weight at 200 days evolved accordingly, in favour of males with 50.63 kg respectively, a body weight of 245.46 kg was recorded for females and 296.09 kg for males. The coefficient of variation for average daily gain and body weight was 19.65 and 16.99%.

The analysis of two or more characters shows that there are some relations or interdependencies between them, due to the sense of value manifestation of their phenotypes. For this purpose, we estimated the correlation between the analyzed characters, and the results are presented in table 4.

Table 4 Correlations between the analyzed characters for the studied herd

Correlations		Birth weight	Average daily gain	RFZ	Mat	TZ	B
Birth weight	Pearson Correlation	1	**.375***	**.235***	-.214	**.315***	**-.236***
	Sig. (2-tailed)		.010	.040	.159	.035	.043
	N	120	120	120	120	120	120
Average daily gain	Pearson Correlation	**.375***	1	-.057	.090	-.074	.197
	Sig. (2-tailed)	.011		.694	.533	.610	.170
	N	45	50	50	50	50	50
RFZ	Pearson Correlation	**.235***	-.057	1	-.106	**.946****	**.348***
	Sig. (2-tailed)	.040	.694		.465	.000	.013
	N	45	50	50	50	50	50
Mat	Pearson Correlation	-.214	.090	-.106	1	**-.394****	.029
	Sig. (2-tailed)	.159	.533	.465		.005	.842
	N	45	50	50	50	50	50
TZ	Pearson Correlation	**.315***	-.074	**.946****	**-.394****	1	.230
	Sig. (2-tailed)	.035	.610	.000	.005		.109
	N	45	50	50	50	50	50
B	Pearson Correlation	**-.236***	.197	**.348***	.029	.230	1
	Sig. (2-tailed)	.043	.170	.013	.842	.109	
	N	45	50	50	50	50	50

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Data from table 4 shows that the birth weight is positively and intermediary correlated with the mean daily gain r=0.375 (37%), the link being significant for p<0.01. Good body weight at birth will positively influence the subsequent evolution of average daily gain.

Also, a good body weight at birth will determine a good improvement value for meat production. The correlation between the body weight at birth and the improvement value (RFZ) is positive and with a low to intermediate value r=0.235 (23%) with p<0.05.

We notice a positive and intermediate Pearson correlation in intensity (31%) between body weight at birth and the average daily gain index r=0.315 for p<0.05. A good body development at birth will later determine a good average daily gain.

The index of muscle mass development at 365 days is negatively and weakly influenced by the body weight at birth r=-0.236, for p<0.05. It seems that a deficient body weight at birth will subsequently cause a deficient development of body mass.

As a conclusion, in the case of the studied herd, we find that both exploitation and genetic factors have positively influenced the results on meat production indicators.

CONCLUSIONS

1. The studied bovine population has a valuable ascendance that has positively influenced the descending results in the meat production indicators.

2. According to international agreements, in the EU, a fattening program is being developed following an extensive technology used for organic meat. The

company for which this study was conducted fulfils all the conditions of the program, applying the extensive exploitation technology on pasture with exceptional results.

3. We consider that in the mountain and hilly areas, the U.E. program, for the production of organic beef is suitable.

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