Research on the Differences in The Average Daily Gain Recorded in Aubrac Bulls

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Abstract
The purpose of this paper is to highlight the difference in the average daily gain recorded in the bulls of the Aubrac breed, exploited in the conditions of our country. The database was made up of data recorded in two fattening bull farms of the Aubrac breed. The average daily gain of the animals recorded at the age of 12 months, as well as the average daily gain at the age of 18 months, were measured. A total of 30 animals (15 animals from farm 1, and 15 animals from farm 2) were studied. The results were statistically interpreted, which showed that there were no significant differences between the animals from the two studied farms, but there were statistically significant differences between the average daily increase recorded at 12 months compared to the average daily increase recorded at 18 months.

Keywords: age, beef cattle, performance.

1. Introduction

The Aubrac is a domestic beef cattle breed originally from France. It is named after the Plateau de l'Aubrac, which is located in the Massif Central in central southern France. Aubrac cattle have a robust body, a well-developed muscle mass, a strong neck, a broad chest and short legs, adapted to the mountain environment [1]. They are a medium-sized breed, with females weighing between 500-800 kg and males between 900-1200 kg. At birth, calves weigh 35-40 kg and have a high growth rate, at 4 months reaching 155-160 kg [2]. Living in the mountain area these animals are resistant to low temperatures. They also have a strong immune system, not being susceptible to diseases characteristic of cattle. They are very easy to maintain cattle, they make very good use of all categories of fodder, they adapt quickly to feeding on large, poor pastures, without significantly influencing their productive level. They are well adapted to harsh local climates and can thrive very well when fed on poor quality pastures [3]. Also, their body is very well adapted to store energy during periods of abundant food and then they can reserve energy for less favourable periods.

The Aubrac breed is famous for the special aroma and tenderness of the meat, having a high degree of marbling, special taste and a very good bone / meat ratio. This meat to bone ratio leads to a good, consistent carcass weight with superior meat quality [4]. Aubrac cattle were brought to Romania for the first time in 2013. They have adapted very well to the operating conditions in our country, benefiting from very good quality pastures here.

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The average daily gain is recognized by all specialists as an appropriate indicator for assessing growth and health. The average amount of weight gained by an animal each day throughout the feeding period is known as the average daily gain (ADG). ADG is computed by dividing the total weight gained by the number of days since the last weighing of an animal. Many factors influence the average daily gain. ADG is determined in part by the animal's diet (which includes forages, grain-based supplements, mineral and vitamin supplements, and feed additives). Whether or not cattle have been implanted with growth hormones or fed ionophores can have a significant impact on ADG [5]. These technologies are intended to increase ADG in those who are already eating a healthy diet. Also, genetics plays a key role in determining ADG. Average daily gain monitoring can help identify production issues. If the cattle have poor performance compared to ADG's expectations, investigations can be made into why this is happening [5]. Maybe a health problem, the problem is hidden in the background or maybe the nutritional value of the feeds is lower. Regarding the production of beef, in the current period and in perspective, in our country the aim is: to increase the quantity, to improve the quality, to decrease the production costs. In order to increase the amount of meat, it is recommended to slaughter the young bulls after reaching the weight of 400 kg, and all adult animals are slaughtered only after a previous reconditioning. Improving the quality of meat to meet current requirements is done using new methods and technologies, intensive and semi-intensive fattening [6]. By fattening the young calves, a greater development of the muscles and a younger flesh are obtained. The stage of fattening can particularly influence both the quantity of meat obtained and its quality. As the weight of fattened animals increases, so does the yield of slaughter, so does the amount of net meat, the percentage of water in the meat decreases and its caloric value increases [7]. Beef is considered by nutritionists to be the healthiest red meat due to its rich content in protein, "healthy" fats, vitamins, minerals and amino acids. These elements play a vital role in ensuring optimal health [8].

2. Materials and methods

The data collected for this research come from the records of the Angus Ro association. Data were recorded in two Aubrac fattening bull farms. The average daily increase of the animals recorded at the age of 12 months, as well as the average daily increase at the age of 18 months were taken in our study. A total number of 30 animals (15 animals from farm 1, and 15 from farm 2) were studied. The difference between ADG at 12 months and ADG at 18 months of age was also calculated.

The working steps followed after compiling the database were the calculation of some statistical parameters (median, mean, standard deviation, standard error of the mean, average confidence limit, minimum value, and maximum value), formulation of statistical hypotheses, choice of significance threshold ($\alpha = 0.05$) and last but not least the difference between the average daily increase recorded at 12 months and the one recorded at 18 months (g/day) for choosing the type of T-student test used.

3. Results and discussion

Table 1 shows the values of the production indicators, registered in the case of the 30 animals studied.

Following the statistical parameters calculated in Table 1, we can see that at the age of 12 months there was a mean of the average daily gain of 972.2 g/day in the case of Aubrac bulls, while at the age of 18 months there was a mean of the average daily gain of 888.6 g/day. The average difference for the average daily gain recorded at the age of 12 months compared to that recorded at the age of 18 months was 83.6 g/day.

To choose the type of T-student test, we first performed the F test to see the type of variance (equal or unequal). Following the application of the F test, the value $P = 0.0482909128566416 < 0.05$ resulted, which means that the variances show statistically significant differences, therefore the T-student test is applied, with unequal variances (Table 2).

Table 1. Production indicators, registered in the case of the 30 animals studied

Farm	Aubrac fattened bull	Average daily gain (g)		Difference (g/day)
		12 months	18 months	
Farm 1	1	920	886	34
	2	1025	977	48
	3	911	710	201
	4	970	957	13
	5	988	733	255
	6	867	843	24
	7	1037	899	138
	8	841	821	20
	9	920	899	21
	10	937	825	112
	11	1179	1100	79
	12	1269	1214	55
	13	836	800	36
	14	1350	1242	108
	15	1028	995	33
Farm 2	1	1038	932	106
	2	750	720	30
	3	855	834	21
	4	920	795	125
	5	896	713	183
	6	1021	856	165
	7	946	854	92
	8	928	867	61
	9	1020	967	53
	10	933	845	88
	11	967	903	64
	12	855	805	50
	13	790	700	90
	14	1236	1123	113
	15	933	842	91
Median		**935**	**855**	**71.5**
Average		**972.2**	**888.6**	**83.6**
Standard deviation		**136.98**	**138.68**	**59.58**
Standard error		**50.016**	**50.637**	**21.755**
Average confidence limit		**363.02**	**331.79**	**31.23**

Following the application of the t-student test, with unequal variances, a value P = 0.643619035620189> 0.05 resulted, which means that there are no statistically significant differences between the two studied farms (Table 3).

To check for statistically significant differences, we applied the t-student test, Paired Two Sample for Means. Following the application of this test, the value P = 1.77247575480227E-08 < 0.001, means that there are statistically significant differences between the average daily increase recorded at 12 months compared to the average daily increase recorded at 18 months (Table 4).

4. Conclusions

Aubrac cattle are adapted to the growing conditions in our country, bringing considerable benefits to farmers. They have an average daily growth of about 1300 g/day, which is very good considering the profitability of raising beef cattle. Following the statistical analysis, it can be seen that there were no significant differences between the animals from the two farms studied, but there are statistically significant differences between the average daily growth recorded at 12 months of age compared to the average daily growth recorded at 18 months of age.

Table 2. F-Test Two-Sample for Variance

	Variable 1	Variable 2
Mean	78.46666667	88.8
Variance	5215.695238	2079.885714
Observations	15	15
df	14	14
F	2.507683572	
P(F<=f) one-tail	**0.048290913**	**P = 0.048290913 < 0.05, which means that the Student t-test is applied for unequal variances**
F Critical one-tail	2.483725741	

Table 3. t-Test: Two-Sample Assuming Unequal Variances

	Variable 1	Variable 2
Mean	78.46666667	88.8
Variance	5215.695238	2079.885714
Observations	15	15
Hypothesized Mean Difference	0	
df	24	
t Stat	-0.468550201	
P(T<=t) one-tail	0.321809518	
t Critical one-tail	1.71088208	
P(T<=t) two-tail	**0.643619036**	**P =0,643619035620189 > 0.05, which means that there are no significant differences between the two cattle farms analysed, therefore the null hypothesis is accepted, H_0**
t Critical two-tail	2.063898562	

Table 4. t-Test Paired Two Sample for Means

	Variable 1	Variable 2
Mean	972.2	888.5666667
Variance	18762.37241	19231.01264
Observations	30	30
Pearson Correlation	0.90664167	
Hypothesized Mean Difference	0	
df	29	
t Stat	7.68863299	
P(T<=t) one-tail	8.86238E-09	
t Critical one-tail	1.699127027	
P(T<=t) two-tail	**1.77248E-08**	**The value of P is very small, <0.001, which means that there are significant differences between ADGs recorded at 12 months of age compared to ADGs at 18 months of age.**
t Critical two-tail	2.045229642	

References

1. Roux E., Pecqueur B., Vollet D., Coordinations d'acteurs et valorisations des ressources territoriales: les cas de l'Aubrac et des Baronnies. Economie Rurale, 2007, n°192;
2. Bianca Maria Mădescu, Roxana Lazăr, Marius Mihai Ciobanu, Paul Corneliu Boișteanu, Morpfo-Productive Characteristics Of Aubrac Cattle Breed: A Sistematic Review (Scientific Papers. Series D. Animal Science, 2021, Vol. LXIV, No. 2, 2021;
3. O.M. Sheveleva*, A.A. Bakharev, L.A. Lysenko, and M.A. Chasovshchikova FSBEI HE, Exterior features and meat productivity of Aubrac breed cattle during acclimatization in the conditions of Northern Trans-Urals, E3S Web of Conferences, 2021, 254, 08004;
4.Valadier A., Sur l'Aubrac: renouveau économique d'un patrimoine identitaire. Séminaire de recherche sur les « systèmes alimentaires durables », 2004, Rambouillet (78);
5. Ibukun M Ogunade, Megan McCoun, Average daily gain divergence in beef steers is associated with altered plasma metabolome and whole blood immune-related gene expression. Translational Animal Science, 2020, Volume 4, Issue 3;
6. Vandendriessche F., Meat products in the past, today and in the future. Meat Science, 2008, 78 (1–2): 104–113;
7. Schonfeldt H. C., Gibson N., Changes in the nutrient quality of meat in an obesity context. Meat Science, 2008, 80 (1): 20–27;
8. Pesonen, M.; Huuskonen, A., Production, carcass characteristics and valuable cuts of beef breed bulls and heifers in Finnish beef cattle population. Agric. Food Sci., 2015, 24, 164–172;