Scientific Papers. Series D. Animal Science. Vol. LXIV, No. 2, 2021
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

MORPFO-PRODUCTIVE CHARACTERISTICS OF AUBRAC CATTLE BREED: A SISTEMATIC REVIEW

Bianca Maria MĂDESCU, Roxana LAZĂR, Marius Mihai CIOBANU, Paul Corneliu BOIȘTEANU

"Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine, Faculty of Animal Sciences, 3 Mihail Sadoveanu Alley, Iasi, 700490, Romania

Corresponding author email: biancamariamadescu@yahoo.com

Abstract

This work reviews the most important aspects of the characterization of the Aubrac beef cattle breed. Into the Romania, this cattle breed was first imported in 2013, from France, after an extensive initial documentation. According to data published by M.A.D.R. in 2018, 808 Aubrac heads were registered, currently more than 2000 heads were registered. Aubrac is an old breed from France, originating from the Aubrac Mountains (southern Central Massif), which in the last 4 years has become an important object of interest for beef cattle breeders in our country. The meat obtained from Aubrac cattle has a beautiful red, intensely marbled, with a high protein content and its subtle aromas makes it one of the tastiest and most appreciated beef. This paper wants to emphasize that the exploitation of this breed in our country could bring great benefits to farmers, being a breed adaptable to environmental conditions in Romania and with extraordinary meat qualities. The paper also reviews the most relevant information in the literature on the Aubrac beef cattle breeds.

Key words*: Aubrac breed, beef, farms.*

INTRODUCTION

Originally from the Aubrac Mountains (southern Central Massif), the Aubrac Breed cow is an old breed in France. Grown mainly in the department of Aveyron, Cantal, Lozere and Haute-Loire, over time it has spread especially in difficult areas, unsuitable for other breeds: the mountainous area (Aude, Puy-de-Dôme, Pyrenees Orientales, etc.) and the plateaus high limestones (Gard, Hérault, Landes, etc.).

Initially bred as a mixed breed later after World War II it was bred mainly for meat production. Although the genealogical register dates from 1893, the selection began many years before (17th century, Benedictine monks who lived in the monastery of Aubrac).

The breed is exploited mainly for meat production, although initially in the nineteenth century, this breed was highly valued for the quality of milk, with a production of about 2,200 kg of milk/lactation, containing about 4.13% fat. Due to the extraordinary organoleptic properties of milk, a type of high-quality was created, famous in France under the Laguiole brand, which is still very popular today. The meat obtained from Aubrac cattle has a beautiful red, intensely marbled, with a high protein content and its subtle aromas makes it one of the tastiest and most appreciated beef.

Due to its hardiness, resistance to a certain hilly and mountainous climate, with a remarkable longevity and survival, excellent recovery of plant nutrients, very low maintenance costs, obtaining a consistent carcass of meat with special organoleptic properties, this breed has become the target of local farmers, being described as a simple, rustic and unpretentious breed.

The main objective of this study was to provide useful information about the morpho-productive characteristics of the Aubrac cattle breed and the future growth prospects.

MATERIALS AND METHODS

To achieve the objectives of this study, several bibliographic sources from the literature were consulted. The main issues addressed concern the morphological and productive evaluation of the Aubrac breed, especially in our country, as well as the adequacy of the adaptation of this breed to the conditions in our country.

The research methods used in this study were the observation, analysis and graphical interpretation of data from the literature on the numerical evolution of our country but also the morpho-productive characteristics (especially meat production) of the Aubrac cattle breed.

RESULTS AND DISCUSSIONS

1. The morphological and productive characteristics of the Aubrac cattle breed

Aubrac breed, the old breed from France, originating from the Aubrac mountains (south of the Massif Central), which in the last 4 years has become an important object of interest for beef cattle breeders in our country.

The breed is of medium size, the cows reaching 550-800 kg and the bulls 900-1200 kg. They have a reddish-brown color, darker around the eyes and snout that continues with white, black skin, lyre-shaped horns. Short neck, wide chest, muscular rump, short and strong legs. The Aubrac breed is distinguished by several characteristics that it possesses and that make it unique.

Rusticity: Aubrac cattle are easy to raise and do not require much intervention from the farmer. Being native to the mountain area, it adapts easily to any climatic conditions, it is resistant to cold and humidity and due to its characteristic color (wheat color) it easily withstands exposure to the sun during summer and extreme heat. It is an unpretentious breed in terms of food. Consume large amounts of coarse fodder even if they are not of the best quality, make excellent use of natural pastures. Aubrac animals are disease resistant, have a very resistant black hoof, can travel long distances to graze (Wegner et al., 2000).

Reproductive performance: fertility is one of the most important indicators in any cow farm. Obtaining one calf a year from each cow is the wish of every farmer. In the Aubrac breed this objective is achieved very easily without treatments and interventions from the farmer. In France the interval between calvings is on average 375 days. Calving is mild 98% of cows face alone without the assistance of the farmer. After calving, cows possess an impressive maternal instinct, defends and take care of her calf, then breastfeed it until the age of 7-8 months.

Longevity: longevity is another characteristic of the Aubrac breed on average, an Aubrac cow ends her productive life at the age of 11 after giving birth to 8-9 calves (5% of cows under official production control in France have a productive life of 12 years).

Productive performance: the Aubrac breed is unique because although it is a rustic breed without great pretensions in terms of feeding and maintenance conditions, it produces a calf that manages to make productive performances similar to the super specialized meat breeds. Thus, the male calves, purebred, easily reach the weight of 275-280 kg at the age of 210 days. Purebred females weigh 240-250 kg at the age of 201 days, average daily increase 1300 g, slaughter efficiency 60% and excellent adaptability to environmental conditions, very resistant to cold. To increase the production performance, crosses can be made with other breeds of meat.

The first Aubrac cows in Romania were purchased in 2013, directly from France. The acquisition of this breed was not a coincidence, but made after extensive documentation. The most important characteristics of the Aubrac breed were the extraordinary qualities of adaptation, the superior taste of the meat, as well as due to the excellent growth increase.

Initially, 15 Aubrac heads were bought, then another 14 pregnant women and a bull were brought, and then another 30 one-year-old heifers. In total reaching many 60 heads.

Then, at the end of 2018, according to statistics published by the C.O.P.C. (M.A.D.R. - A.N.Z.) at the level of our country there was a staff of 808 Aubrac heads.

Nr.crt.	RASA	ASOCIAȚIE C.O.P.C.							Total
		A.C.A. ARAD	A.ABERDEEN ANGUS SIBIU	A.ANUGUS RO SUCEAVA	A.C.B.C.R. SUCEAVA	A.C.B. NARCISA	C.O.O.P. CLUJ	A.C.V.B R	
1	Aberdeen Angus	11	31721	46	203	267	360		32610
2	Aubrac	10	0	798		0			808
3	Blonde D'Aquitaine				91				91
4	BB								
5	Charolais	740	61		2850	338	101		4090
6	Galloway		95	253		29			377
7	Hereford			0					0
8	Highland		59	312					371
9	Limousin	13	360		2557	30	97	10	3067
10	BR-Simmental	365	43		101	4	948	6	1467
11	Romagnola								0
12	Grey Steppe			811	5				816
13	Salers		45						45
TOTAL R.C.		1139	32384	2222	5807	668	1506	16	43742
TOTAL METISI R.C.		168	5240	124	1601	296			7429
TOTAL		1307	37624	2346	7408	964	1506	16	51171

Figure 1. Cattle herds specialized for meat production, by breeds and associations C.O.P.C. (source: http://www.anarz.eu/)

There are currently an estimated 2,000 head of Aubrac cattle in Romania. At present, very little data about this breed are recorded in our country, given the fact that it is a new breed, but I consider that it is in a process of continuous development.

2. Meat production of the Aubrac breed

Meat is an important part of the human diet, with strong implications for health, economy and culture (Web, 2008). The beef production in the EU fell in 2019 due to lower prices and reduced herds. It fell further in 2020 due to the same factors and the COVID-19 pandemic, which led to a reduced in slaughter in the second quarter and narrowed production and demand for high-quality tranches. A small recovery is expected in the second half of 2020, with the overall reduction being 1.7% for the full year (Bendikas et al., 2009).

The United States, Brazil and the European Union produce about 47% of the world's beef, with about 19%, 15%, and 13%, respectively. On average, beef consumption in Europe is around 16 kg per capita (20% of total meat consumed). This proportion of beef consumption is lower than that observed in Argentina, Brazil, the United States and Australia, where beef accounts for 55%, 41%, 34%, and 37% of total meat consumed, respectively (Vandendriessche, 2008). Total beef consumption is likely to increase from 2011 to 2025 with the lowest increases in Australia and the European Union and the highest increases in Brazil and China. Similarly, the largest increases in production are likely to occur in Brazil and China from 2011 to 2025 and the lowest in the European Union and especially in the United States, which will probably produce less beef in 2025 compared to 2011. Beef exports are likely to increase from 2011 to 2021 in major countries, except the European Union and China and especially the United States (Stimbirys et al., 2016).

Romania, through the potential for grazing and raising beef cattle in an extended system, is ideally placed to respond to these fashionable market signals. Romanian farmers have the ability to sustainably increase production to meet global demand.

In our country, in November 2020, 51,000 head of cattle were slaughtered, increasing by 8.5% compared to October 2020, but decreasing by 7.3% compared to November 2019. Meat production obtained in November 2020 from slaughtered animals reached 8,330 tons, compared to 7,583 tons in October 2020 and 9,274 tons in November of the previous year (www.fao.org).

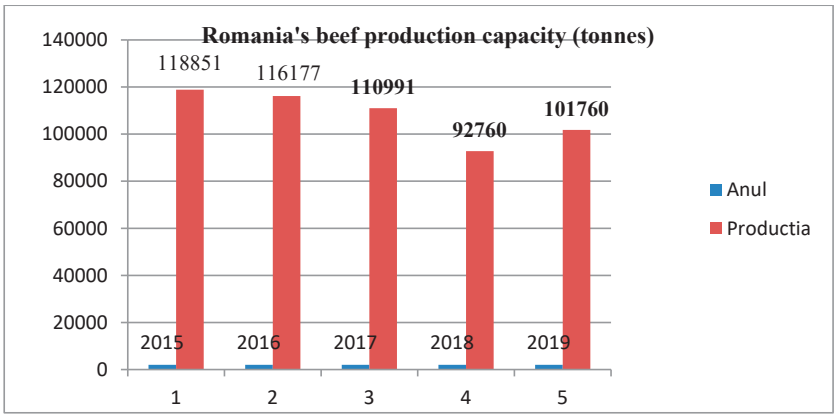

Figure 2. Romania's production capacity for beef (source: made by the author based on FAO data, 2015-2019)

Also, based on the graph, a slight decrease in beef production can be observed in the period 2015-2019.

The chemical composition of meat depends on the species, age and sex of the animals, feeding conditions and health (Boișteanu et al., 2002). Assessments of the physical properties of meat are made according to color, pH, water retention capacity, shear loss of strength and cooking (Bendikas et al., 2008; Jukna et al., 2009 a;). The water retention capacity is an important technological feature in the meat industry (Vavrišinova et al., 2013). The color and appearance of the meat is its commercial image. The pH level determines the suitability of the meat for sale and is associated with the color of the meat and the water retention capacity (Oury et al., 2009).

In a research conducted by Lithuanian researchers in 2017 on the quality of meat of different breeds of cattle, they showed that intramuscular fat influenced meat flavor and juiciness. Thus, the beef from the Charolais and Aubrac breeds was of the highest quality, while the meat from the Limosine breed was of a lower quality. In terms of meat consistency, the samples from the Aubrac breed were harsher and the meat from the Charolais breed was softer in consistency. The difference reached up to 0.9 kg cm^2 ($P<0.01$). The differences in meat water content and water loss through cooking were not significant.

In French cattle breeds, Mordenti et al., in 2018, demonstrated that selection on muscle mass was associated with a decrease in intermuscular and intramuscular fat content, but also collagen. For example, the main meat breeds Charolaise, Limousine and Blonde d'Aquitaine have less intermuscular and intramuscular fat than environmentally resistant breeds such as Aubrac and Sales.

Gagaoua et al. in 2018 showed that in the case of Aubrac bulls, slaughtered at the age of one year, there was a slaughter yield of 58%, with an average carcass weight of 262 kg, higher values than other breeds such as Charolais or Normandy.

Jukna et al. studied in 2017 the quality of meat from 6 breeds of cattle specialized for meat production, including meat from the Aubrac breed.

Table 1. The chemical composition of beef from different breeds of meat (after Junka et al., 2017)

CHEMICAL COMPOSITION				
BREED	**Dry matter**	**Protein**	**Fat**	**Mineral substances**
Charolais	24.87 ± 0.25	21.60 ± 0.14	2.19 ± 0.27	1.09 ± 0.10
Simmental	23.35 ± 0.54	21.77 ± 0.27	1.83 ± 0.17	1.10 ± 0.03
Limousine	24.50 ± 0.26	22.10 ± 0.28	1.24 ± 0.15	1.15 ± 0.09
Hereford	25.17 ± 0.54	21.44 ± 0.27	2.51 ± 0.09	1.20 ± 0.07
Aubrac	**25.43 ± 0.23**	**23.23 ± 0.34**	**1.03 ± 0.05**	**1.17 ± 0.11**
Angus	24.26 ± 0.11	20.47 ± 0.81	1.58 ± 0.14	1.15 ± 0.12

Aubrac meat was determined to have the highest rate of meat protein sufficiency, whereas the lowest rate was found in Hereford meat. The difference reached up to 1.79% ($P<0.05$). Differences between breeds were also observed for meat sensitivity. The hardest meat was from Aubrac cattle, while the tenderest was from Charolais. The difference reached up to 0.9 kg cm^{-2} ($P<0.01$). There were no significant differences between breeds for meat water content, water retention capacity. Intramuscular fat levels varied by race. Hereford meat has had the highest level of intramuscular fat, while the lowest level has been found in Aubrac meat. The difference was 1.48% ($P<0.05$). Differences between breeds were also observed for the physical quality of the meat. The meat of the French breeds (Charolais and Limousine) was lighter and had a higher water retention capacity - 0.78-0.82% ($P>0.05$) compared to the meat of the English breeds (Hereford and Angus).

In terms of protein content, beef is superior to pork or battalion. The protein/lipid ratio varies from 1/0.5 for veal to 1/1.8 for fatty beef (Chambaz et al., 2003).

Meat, in general, has a high content of essential amino acids, and beef in particular, is richer in the following amino acids: lysine, methionine, glutamic acid. The content of essential amino acids is significantly equal to that of chicken and higher than that of pork and sheep. Pork is richer in valine and arginine, and sheep in leucine and thiamine. For example, the consumption of 100 g beef provides an intake of 26 g protein. Aubrac beef is known for its very high protein content.

The biological value of the meat varies according to age, fattening status and region of slaughter. Meat from adult animals has a lower biological value than youth, semi-fat and fatty meat has a higher content of amino acids. The amount of essential amino acids is higher in regions rich in musculature.

The energy value varies greatly in relation to the state of fattening, age and anatomical or butchery region. Fat and very fatty meat have an energy value of 50-60% respectively, 80-110% higher than the lean one. Butcher regions rich in muscle have a lower energy value than regions of poorer quality rich in adipose tissue.

While in pork, the share of protein in ensuring energy levels is low, in beef it is higher. Protein calories represent 45-46% in veal, 33-35% in lean beef and 20-22% in fatty beef.

Meat is an important source of B vitamins (B1, B2, PP, B6, folic acid, pantothenic acid, B12). Beef covers 100% of the daily requirement of human B12 vitamins, 63% of the need for vitamin PP, 22.24% of that of vitamin B6 and 10% of that of vitamin B2. Internal organs and intermuscular fat have a higher content of fat-soluble vitamins. Beef is poor in vitamin C and vitamins K and D.

Meat is an important source of minerals: iron, sodium, potassium (Jurie et al., 2006). Phosphorus, sulphur and chlorine are found in large quantities, which determine the acidifying action of meat in the human body. The nutritional value of beef is given by the high iron content, respectively 2.1-4.0 mg/100 g muscle and 7-8 mg/100 g liver and fresh kidney. Of the total amount of iron, 80-85% is found in the form of heme and 15-20% ferritin. Along with iron, potassium, phosphorus, sulphur and chlorine are found in large quantities in beef. Copper, zinc, magnesium, selenium, manganese, cobalt, aluminium, etc. are found in small but sufficient quantities in beef (Soulat et al., 2016).

CONCLUSIONS

The meat from Aubrac cattle has special features, having a beautiful red, intensely marbled, with a high protein content and its subtle aromas make it one of the tastiest and most appreciated beef.

Objectively, the quality of meat is the sum of five major complexes of properties, which are the result of the physico-chemical and morphological composition of the meat, as well as its microbiological properties.

REFERENCES

Mordenti, A.L., Broga, N., Canestrari, G., Bonfante, E., Eusebi, S., Mammi, L.M.E., Gieretta, E., & Formigoni, A. (2018). Effects of breed and different lipid dietary supplements on beef quality. *Animal Science Journal*, doi: 10.1111/asj.13177;

Stimbirys, A., Shernienė, L., Prusevichus, V., Jukna, V., Shimkus, A., & Shimkienė, A. (2016). The influence of different factors on bulls carcass conformation class in Lithuania. *Bulgarian Journal of Agricultural Science*, 22 (4), 627–634.

Bendikas, P., Uchockis, V., Jonaitis, L., & Tarvydas, V. (2009). The influence of different energy and protein content on weight gains and meat quality of young bulls. *Veterinarija ir zootechnika*, 45 (67), 8–12.

Boișteanu, P.C., Mărgărint, I. (2002). *Animal physiology*. Iași, RO: Ion Ionescu de la Brad Publishing House.

Boișteanu, P.C., Mărgărint, I., & Lazăr, R. (2015). *Morphophysiological bases of meat production*. Iași, RO: Ion Ionescu de la Brad Publishing House.

Chambaz, A., Scheeder, M.R.L., Kreuzer, M., & Dufey, P.A. (2003). Meat quality of Angus, Simmental, Charolais and Limousine steers compared at the same intramuscular fat content. *Meat Science*, 63 (4), 491–500;

Jurie, C., Martin, J.F., Listrat, A., Jailler, R., Culioli, J., & Picard, B. (2006). Carcass and muscle characteristics of beef cull cows between 4 and 9 years of age. *Animal Science*, 82, 415–421.

Dransfield, E., Martin, J.F., Bauchart, D., Abouelkaram, S., Lepetit, J., Culioli, J., Jurie, C., & Picard, B. (2003). Meat quality and composition of three muscles from French cull cows and young bulls. *Anim. Sci*., 76, 387–399.

Gagaoua, M., Picard, B., & Monteils, V. (2018). Associations among animal, carcass, muscle characteristics, and fresh meat color traits in Charolais cattle. *Meat Sci*., 140, 145–156.

Jukna, V., Jukna, Č., Pečiulaitienė, N., & Kerinas, E. (2009). Influence of cattle sex and age on carcass yield and muscularity class. *Veterinarija ir zootechnika*, 46 (68), 20–23 (in Lithuanian).

Oury, M.P., Picard, B., Briand, M., Blanquet, J.P., & Dumont, R. (2009). Interrelationships between meat quality traits, texture measurements and physicochemical characteristics of M. rectus abdominis from Charolais heifers. *Meat Sci*., 83, 293–301.

Soulat, J., Picard, B., Léger, S., & Monteils, V. (2016). Prediction of beef carcass and meat traits from rearing factors in young bulls and cull cows. *J. Anim. Sci*., 94, 1712–1726.

Vandendriessche, F. (2008). Meat products in the past, today and in the future. *Meat Science*, 78 (1–2), 104–113.

Jukna, V., Jukna, Č., & Prusevičius, V. (2017). Meat quality of different beef cattle breeds fed high energy forage. *Zemdirbyste-Agriculture*, 104 (3), 277–282.

Web, E.C., & O'Neill, H.A. (2008). The animal fat paradox and meat quality. *Meat Science*, 80 (1), 28–36.

Wegner, J., Albrecht, E., Fieldler, I., Teuscher, F., Papstein, H.J., & Ender, K. (2000). Growth- and breed-related changes of muscle fiber characteristics in cattle. *Journal of Animal Science*, 78, 1485-1496.

*http://www.fao.org/faostat/en/#data/CL.