

## RESEARCH ON THE ECONOMIC ADVANTAGES OF BREEDING AUBRAC BEEF CATTLE: A REVIEW

Bianca-Maria MADESCU<sup>1</sup>, Roxana LAZAR<sup>1</sup>, Andrei Cristian MATEI<sup>2</sup>,  
Paul Corneliu BOISTEANU<sup>1</sup>

<sup>1</sup>“Ion Ionescu de la Brad” Iasi University of Life Sciences, 3 Mihail Sadoveanu Alley, 700490,  
Romania

<sup>2</sup>“Alexandru Ioan Cuza” University, 22 Carol I Blvd, Iasi, Romania

Corresponding author email: biancamadescu@yahoo.com

### Abstract

*Increased interest in breeding beef cows is a result of societal trends, particularly the consumption of high-quality raw protein of animal origin. The sustainability of the beef industry requires high on-farm efficiency and productivity, as well as efficient value chains that reward achievement of target market specifications. This work reviews the most important aspects of the characterization of the Aubrac beef cattle breed, namely: productive qualities (dynamics of body weight of young animals 0-18 months, average daily gain, economic efficiency of growing breeding calves for a period of 18 months of growing, results of bulls control slaughtering), morphological parameters of the carcass (muscle tissue, fat tissue, total meat, connective tissue, bones, flashing index) and chemical composition of the meat and energy value. In the near future, this breed will be one of the most appealing options for obtaining high-quality meat without incurring prohibitively high prices, with the cattle making excellent use of our country's meadows while also easily adapting to relief and climate.*

**Key words:** beef cattle, economic efficiency, morpho-productive qualities.

### INTRODUCTION

Breeding cattle for meat production is a vital aspect of the agricultural industry. Currently, one of the most important and challenging issues facing the country's agro-industrial complex is the need to increase beef production. To achieve this, the creation of a specialized beef cattle industry is necessary. However, the existing pool of breeding animals of meat breeds, in terms of quantity and breed structure, is inadequate to meet the demands of the beef cattle industry. Therefore, it is essential to develop beef cattle breeding by utilizing domestic breeds and accessing new, promising resources from the global gene pool, such as the French-rooted breeds. The French meat breeds are preferred in many countries worldwide due to their long growth period, high growth intensity, and favorable nutrient ratios in the carcass (Mădescu et al., 2021).

The Aubrac breed is a type of cattle that originated in the Aubrac region of central France. This breed is one of the oldest breeds of cattle in France and is known for its adaptability to harsh environmental conditions. Aubrac cattle are medium to large in size and have a

robust and powerful appearance, with curved horns that extend outwards. These animals are raised for both meat and milk and are considered to have particularly high-quality meat. Aubrac beef is especially prized for its flavor and low fat content. Additionally, the Aubrac breed is known for its ability to adapt to grazing conditions and produce meat efficiently in a grazing system.

Aubrac cattle are typically red or black in color, with a white or cream-colored stripe down their back. They are known for their sturdy and robust appearance, with strong legs and a deep chest. Aubrac cattle have a docile temperament and are well-suited to grazing on open pastures.

In terms of milk production, the Aubrac breed is not as high-yielding as some other dairy breeds. However, the milk that is produced is of excellent quality and is used to make high-quality cheeses.

One of the key characteristics of the Aubrac breed is its adaptability to a range of different environments. Aubrac cattle are well-suited to grazing in harsh mountainous terrain, and they are able to tolerate cold temperatures and high altitudes. They are also resistant to many common cattle diseases, making them a hardy

and low-maintenance breed. Overall, the Aubrac breed is a valuable addition to any cattle farming operation, particularly for those looking to produce high-quality beef in a grazing system. With their robust appearance, docile temperament, and adaptability to a range of different environments, Aubrac cattle are a popular choice for farmers in many regions of the world (Mădescu et al., 2022).

## MATERIALS AND METHODS

In order to reach the objectives of this study, 23 bibliographic sources from the specialized literature were consulted. The main issues addressed refer to the productive qualities, morphological parameters of the carcass and chemical composition of the meat of the Aubrac cattle breed. The research methods used in this study were the observation, analysis and interpretation of data from the specialized literature.

## RESULTS AND DISCUSSIONS

### 1. Productive qualities

The dynamics of body weight and average daily gain are important factors to consider when raising young animals, such as cattle, pigs, or sheep, for meat production.

Body weight dynamics refer to how an animal's weight changes over time. For young animals, weight gain is typically rapid as they grow and develop. The rate of weight gain can vary depending on a number of factors, including breed, genetics, nutrition, and overall health.

Average daily gain (ADG) is a measure of the average weight gain per day of an animal. It is calculated by dividing the total weight gain of the animal by the number of days it has been gaining weight. ADG can be used to track the growth and development of young animals, and it is an important factor in determining the appropriate time to market them for meat production (Paula et al., 2013).

Farmers and ranchers often monitor the dynamics of body weight and ADG of their

young animals closely, as it can provide important information about their health and well-being. Regular weighing of the animals can help to track their growth and ensure that they are on track to meet production goals. appropriate time to market them for meat production (Paula et al., 2013).

To promote healthy weight gain and ADG in young animals, farmers and ranchers must provide them with a balanced diet that meets their nutritional needs. This may involve a combination of feed, forage, and supplements. It is also important to ensure that young animals have access to clean water and a comfortable living environment (Mădescu et al., 2021).

Aubrac cattle are a breed of cattle that are primarily raised for beef production. Like other breeds of cattle, the dynamics of body weight and average daily gain are important factors to consider when raising young Aubrac animals.

According to available data, Aubrac cattle are known for their moderate growth rate and their ability to convert forage into meat efficiently. As with other cattle breeds, the growth rate of Aubrac calves is influenced by various factors, including genetics, nutrition, and environmental conditions.

Research has shown that Aubrac calves typically have an average daily gain (ADG) of around 0.9 to 1.2 kg per day during the first few months of life. However, this rate can vary depending on factors such as the quality and quantity of feed, access to clean water, and environmental conditions (Mădescu et al., 2022).

To ensure healthy growth and development, it is important to provide Aubrac calves with a balanced diet that meets their nutritional needs. This may involve a combination of forage, concentrates, and supplements. Farmers and ranchers may also use growth-promoting technologies, such as implants or feed additives, to promote ADG and improve feed efficiency.

Regular weighing of the animals can help farmers and ranchers monitor their growth and make adjustments to their diet or management practices as needed. In general, young Aubrac animals are raised for about 18 to 24 months before being marketed for beef production.

Table 1. Dynamics of body weight and average daily gain of Aubrac cattle

Dynamics of body weight of young animals ( $\bar{x} \pm \text{sx}$ ), kg			Average daily gain ( $\bar{x} \pm \text{sx}$ ), g		
Age (months)	Heifers	Bulls	Age (months)	Heifers	Bulls
At birth	27.6 ± 0.79	28.3 ± 1.04	0 - 6	716.1 ± 39.47	743.3 ± 26.63
6	156.5 ± 3.50	162.1 ± 3.58	0 - 8	653.7 ± 23.08	700.4 ± 15.95
8	184.5 ± 6.20	196.4 ± 5.60	8 - 12	690.0 ± 31.84	842.5 ± 45.20
12	267.3 ± 7.68	297.5 ± 9.10	12 - 15	534.4 ± 29.41	783.3 ± 37.14
15	315.4 ± 9.27	368.0 ± 7.47	15 - 18	622.2 ± 44.26	994.4 ± 28.30
18	371.4 ± 20.75	457.5 ± 18.34	0 - 18	716.1 ± 39.47	743.3 ± 26.63

In the Table 1, we can see that bulls register slightly higher average daily gains than females (for example, in the period 0-6 months, the heifers recorded an average of the average daily gain of approximately  $716.1 \pm 39.47$ , while the bulls recorded an average of the average daily gain of  $743.3 \pm 26.63$ ), but the differences are not very significant. There can be several reasons why male Aubrac cattle have a slightly higher average daily weight gain than females: *Genetics*: Male and female animals often have different genetic traits that can influence their growth rates. It is possible that the male Aubrac cattle have certain genetic traits that promote faster growth and weight gain (Soulat et al., 2016).

*Hormonal differences*: Male and female animals also have different hormone profiles that can

affect their growth rates. Male cattle produce more testosterone, which can promote muscle growth and weight gain.

*Feeding practices*: It is possible that the male and female Aubrac cattle are being fed different diets or receiving different amounts of feed, which can influence their growth rates.

*Social dynamics*: Male and female cattle may also have different social behaviors and hierarchies that can affect their access to feed and water, and ultimately their growth rates. However, it is important to note that the difference in weight gain between male and female Aubrac cattle during the 0-6 month period is relatively small. Overall, both males and females of this breed are known for their efficient conversion of forage into meat and their moderate growth rates.

Table 2. Economic efficiency of growing breeding calves for a period of 18 months of growing and results of bulls control slaughtering

Economic efficiency of growing breeding calves for a period of 18 months of growing		Results of bulls control slaughtering ( $\bar{x} \pm \text{sx}$ ), g	
Received gain (kg)	429.2	Preslaughter live weight, kg	382.3 ± 13.72
Spent EFU per 1 kg of growth	6.53	Hot carcass weight, kg	209.3 ± 5.08
The cost of obtaining and growing of 1 head (€)	501.75	Weight of visceral crude fat, kg	2.23 ± 0.11
The cost of 1 centner of growth (€)	116.90	Slaughter weight, kg	211.5 ± 5.08
Proceeds from the sale of 1 head, (€)	724.65	Carcass yield %	54.8 ± 1.35
Profit on 1 head, (€)	222.89	Crude fat yield %	0.58 ± 0.22
Profitability level, %	44.4	Slaughter yield %	55.4 ± 1.36

Growing breeding calves for beef for a period of 18 months can be economically efficient, as it can result in high-quality beef and potential profits from selling breeding stock (Gagaoua M. et al., 2018).

Breeding calves raised for beef are typically selected for their genetics and growth potential, with the aim of producing high-quality beef. By raising these calves for a longer period of time, farmers can improve the quality of the beef, as the animals have more time to develop and put on weight. This can result in higher prices for the beef, which can increase profitability.

In addition, breeding calves can be sold as breeding stock, providing an additional source of income for farmers. If the calves are well-managed and have desirable genetics, they can be sold to other farmers for breeding purposes, allowing the original farmer to earn a profit on the sale of the calves as well as on the sale of their offspring (Esteve & Bouchy, 2002).

However, there are also potential drawbacks to growing breeding calves for beef for 18 months. As with any livestock production, there are risks associated with disease, weather, and other factors that can impact the health and

productivity of the animals. The longer growth period can also increase production costs, particularly if the animals require more feed, water, and other resources.

The economic efficiency of growing breeding calves for beef for a period of 18 months will depend on a variety of factors, including market conditions, production costs, and the quality of the animals being raised. If managed well, breeding calves can potentially yield higher profits than calves raised for meat, as they can produce high-quality beef and also be sold as breeding stock.

The results of bulls control slaughtering include several measurements that can provide important information about the quality of the meat and the efficiency of the production process. These measurements include preslaughter live weight, hot carcass weight, weight of visceral crude fat, slaughter weight, percentage, and slaughter yield percentage.

Preslaughter live weight refers to the weight of the animal before it is slaughtered, while hot carcass weight refers to the weight of the animal's body after it has been slaughtered and dressed but before it has been cooled. The weight of visceral crude fat refers to the amount of fat that is found in the animal's internal organs (Dransfield et al., 2003).

Slaughter weight is the weight of the animal's body after it has been slaughtered and dressed, while carcass yield percentage is the proportion of the animal's preslaughter live weight that is represented by the hot carcass weight. Crude fat yield percentage is the proportion of the hot carcass weight that is represented by the weight of visceral crude fat.

Finally, slaughter yield percentage is the proportion of the animal's preslaughter live weight that is represented by the slaughter weight. These measurements can be used to assess the efficiency of the production process, as well as the quality of the meat that is produced. By monitoring these measurements over time, producers can make adjustments to their management practices to improve efficiency and quality.

A mean of preslaughter live weight of  $382.3 \pm 13.72$  kg for the Aubrac breed is a relatively good weight. The Aubrac breed is known for producing high-quality beef, and a preslaughter weight in this range suggests that the animals are

being well-managed and are receiving appropriate nutrition and care.

However, it is important to note that preslaughter weight alone is not necessarily a good indicator of the quality of the meat that is produced. Other factors, such as the animal's genetics, age, and diet, can also play a significant role in determining meat quality (Gagaoua et al., 2018; Maysonnave et al., 2020). A preslaughter live weight of  $382.3 \pm 13.72$  kg for the Aubrac breed is a positive sign, but it is important to consider other factors as well when evaluating the quality of the meat that is produced (Table 2).

Slaughter yield % is a measure of how much usable meat is obtained from a slaughtered animal, expressed as a percentage of its live body weight. It can be influenced by various factors such as breed, weight, age, sex, feeding, and rearing conditions.

Slaughter yield % is a measure of how much usable meat is obtained from a slaughtered animal, expressed as a percentage of its live body weight (Esteve & Bouchy, 2002). It can be influenced by various factors such as breed, weight, age, sex, feeding, and rearing conditions. Aubrac cattle are known for their high-quality beef production. The reported Slaughter yield % of  $55.4 \pm 1.36$  for this breed is considered to be within the range of other beef breeds. However, it is important to note that there can be natural variation in the slaughter yield between individual animals of the same breed. The Slaughter yield of  $55.4 \pm 1.36\%$  for Aubrac cattle appears to be a good value and can be considered a positive characteristic of this breed in terms of meat production (Maysonnave et al., 2020).

## **2. Morphological parameters of the carcass**

Morphological parameters of the carcass in beef cattle refer to the external physical characteristics of the animal's body after it has been slaughtered and processed for meat production (Mădescu et al., 2021). These parameters are important in determining the quality and value of the meat, as well as the yield of usable meat from the carcass. Some of the commonly measured morphological parameters of the carcass in beef cattle include:

*Muscle tissue:* The amount of muscle tissue in the carcass is an important indicator of meat yield and quality. It is typically measured by

determining the weight of the lean meat in the carcass or by calculating the rib-eye area (Astruc et al., 2014).

*Fat tissue:* The amount of fat tissue in the carcass is also important, as it affects meat flavor, juiciness, and tenderness. It is usually measured by determining the thickness of subcutaneous fat or by estimating the marbling score.

*Total meat:* This parameter refers to the total amount of meat obtained from the carcass, including both lean meat and fat.

*Connective tissue:* Connective tissue is an important component of meat quality, as it affects tenderness and juiciness. It is usually

measured by determining the collagen content in the meat (Astruc et al., 2014; Purslow, 2005).

*Bones:* The amount of bones in the carcass is also important, as it affects meat yield and value. It is typically measured by determining the weight of the bone-in carcass.

*Fleshing index:* This parameter is a measure of the amount of muscle tissue relative to the weight of the carcass. It is usually calculated as the ratio of the rib-eye area to the weight of the carcass.

Overall, these morphological parameters of the carcass are important in determining the value and quality of meat obtained from beef cattle.

Table 3. Morphological parameters of the carcass ( $x \pm sx$ )

Indicator	Morphological parameters of the carcass ( $x \pm sx$ )	
	kg	%
Muscle tissue, kg	146.3 $\pm$ 7.24	71.7 $\pm$ 1.87
Fat tissue, kg	4.27 $\pm$ 0.57	2.1 $\pm$ 0.31
Total meat, kg	150.6 $\pm$ 6.73	73.8 $\pm$ 1.55
Connective tissue, kg	9.0 $\pm$ 0.53	4.4 $\pm$ 0.29
Bones, kg	21.7 $\pm$ 1.28	21.7 $\pm$ 1.28
Flashing index	3.62 $\pm$ 0.28	-

The values you provided for the morphological parameters of the carcass in Aubrac beef cattle are indicative of a high-quality meat product. The relatively high percentage of muscle tissue (71.7  $\pm$  1.87%) suggests that these animals have a good meat yield, while the low percentage of fat tissue (2.1  $\pm$  0.31%) suggests that the meat is likely to be lean and healthy.

The total meat percentage (73.8  $\pm$  1.55%) indicates that the majority of the carcass is composed of usable meat, and the connective tissue percentage (4.4  $\pm$  0.29%) is within the normal range for beef cattle (Table 3). Connective tissue is important in determining meat tenderness, and the relatively low percentage in Aubrac beef cattle suggests that the meat may be tender and of good quality (Astruc et al., 2014). Overall, these morphological parameters suggest that Aubrac beef cattle may produce high-quality meat with a good yield of usable meat. However, it is important to note that these values may vary depending on the specific conditions of the study or experiment, and that other factors such as animal age, weight, and feeding regime can

also influence the characteristics of the carcass (Begoña Panea et al., 2018).

Also, following the research carried out by a number of authors, the following morpho-productive qualities of the Aubrac cattle breed were reported in Table 4.

The values provided for the weight of Aubrac beef cattle at 18 months are indicative of the growth potential of this breed. The range of weights reported, from 414 kg to 646.5 kg, suggest that there may be some variability in growth rates within the breed, likely influenced by factors such as feeding and management practices.

The weights reported by Bakharev in 2018 are within a relatively narrow range, with bulls weighing between 457.5  $\pm$  18.34 kg and 471.6  $\pm$  16.34 kg. The weights reported by Sheveleva (564.8  $\pm$  7.1 kg) and Stimbirys (646.5 kg) are notably higher than those reported by Bakharev. This may be due to differences in management practices or genetic variation within the breed (Bakharev et al., 2018a; Sheveleva et al., 2021; Stimbirys et al., 2016).

Table 4. Morpho-productive qualities of Aubrac cattle breed

Parameters	Value ( $\bar{x} \pm S\bar{x}$ )	References
Weight at 18 months (bulls), kg	457.5 $\pm$ 18.34	Bakharev (2018a)
	564.8 $\pm$ 7.1	Sheveleva (2021)
	414	Mordenti (2018)
	471.6 $\pm$ 16.34	Bakharev (2018b)
	646.5	Stimbirys (2016)
Average daily gain at 18 month (bulls), g	820.0 $\pm$ 20.93	Bakharev (2018a)
	794.8 $\pm$ 15.24	Bakharev (2018b)
	942.2	Sheveleva (2021)
Preslaughter live weight, kg	382.3 $\pm$ 13.72	Bakharev (2018a)
	545.4 $\pm$ 12.1	Sheveleva (2021)
	753.3 $\pm$ 23.4	Piedrafitra (2003)
	686	Mordenti (2018)
Carcass weight, kg	203.9 $\pm$ 5.59	Bakharev (2018a)
	314.1 $\pm$ 3.4	Sheveleva (2021)
	451.0 $\pm$ 16.3	Piedrafitra (2003)
Muscle tissue %	399	Mordenti (2018)
	71.7 $\pm$ 1.87	Bakharev (2018a)
	77.5	Sheveleva (2021)
Bone %	76.1 $\pm$ 2.3	Piedrafitra (2003)
	16.2	Sheveleva (2021)
	15.4 $\pm$ 1.4	Piedrafitra (2003)
Total fat %	21.7 $\pm$ 1.28	Bakharev (2018a)
	2.1 $\pm$ 0.31	Bakharev (2018b)
	3.0	Sheveleva (2021)
	7.6 $\pm$ 1.7	Piedrafitra (2003)

The reported weights suggest that Aubrac beef cattle can achieve significant weight gain by 18 months of age, which may contribute to the breed's reputation for producing high-quality meat with good yields. However, it is important to note that individual animal weights can vary widely based on factors such as genetics, nutrition, and management practices.

The average daily gain values reported for Aubrac beef bulls at 18 months of age indicate the rate at which they are gaining weight during the period of growth.

The reported values range from 794.8  $\pm$  15.24 g to 942.2 g. The higher value reported by Sheveleva (942.2 g) suggests a faster growth rate compared to the values reported by Bakharev (820.0  $\pm$  20.93 g and 794.8  $\pm$  15.24 g). (Bakharev et al., 2018a; Sheveleva et al., 2021). A higher average daily gain may indicate more efficient conversion of feed into body weight gain, which can lead to earlier maturity and higher carcass weights. However, it is important to note that individual animal performance can

vary widely based on factors such as genetics, nutrition, and management practices. Aubrac beef bulls have the potential for good growth rates and efficient feed conversion, which may contribute to their reputation for producing high-quality meat with good yields.

The preslaughter live weight values reported for Aubrac beef cattle suggest a wide range of weights at the time of slaughter, which can have implications for carcass weight and meat quality.

The reported values range from 382.3  $\pm$  13.72 kg to 753.3  $\pm$  23.4 kg. The higher values reported by Sheveleva (545.4  $\pm$  12.1 kg), Piedrafitra (753.3  $\pm$  23.4 kg), and Mordenti (686 kg) suggest a larger animal size at slaughter compared to the value reported by Bakharev (382.3  $\pm$  13.72 kg).

Larger preslaughter live weights may result in larger carcass weights, but it is important to note that larger animals may not necessarily result in higher quality meat. The age at which an animal is slaughtered, as well as factors such as

genetics, nutrition, and management practices, can also impact meat quality (Sheveleva et al., 2021; Mordenti et al., 2019; Bakharev et al., 2018; Stimbirys et al., 2016).

The reported preslaughter live weight values suggest that Aubrac beef cattle can reach a range of weights at the time of slaughter, which may provide flexibility for producers in terms of market options. However, it is important to consider factors beyond live weight, such as age and meat quality, when making management decisions for these animals.

The reported carcass weight values for Aubrac beef suggest a wide range of weights, which can have implications for meat production and market options.

The reported values range from  $203.9 \pm 5.59$  kg to  $451.0 \pm 16.3$  kg. The higher values reported by Piedrafita ( $451.0 \pm 16.3$  kg) and Sheveleva et al. (2021) ( $314.1 \pm 3.4$  kg) suggest that Aubrac beef can potentially produce larger carcasses compared to the values reported by Bakharev et al. (2018) ( $203.9 \pm 5.59$  kg) and Mordenti et al. (2019) (399 kg).

Larger carcass weights may result in higher meat yields, but it is important to note that the quality of the meat can also be influenced by factors such as marbling, meat color, and texture. Additionally, market demands may vary based on the weight and size of the carcass, with some markets preferring smaller carcasses while others prefer larger ones.

Overall, the reported carcass weight values suggest that Aubrac beef can produce a range of carcass weights, which may provide flexibility for producers in terms of market options. However, it is important to consider factors beyond carcass weight, such as meat quality and market demands, when making management decisions for these animals.

The reported values for muscle tissue percentage in Aubrac beef suggest that this breed has a relatively high proportion of muscle tissue in the carcass, which can be a desirable trait for meat production.

The reported values range from  $71.7 \pm 1.87\%$  to  $77.5\%$ , with the highest value reported by Sheveleva. The values reported by Bakharev ( $71.7 \pm 1.87\%$ ) and Piedrafita et al. (2003) ( $76.1 \pm 2.3\%$ ) are also relatively high and suggest that Aubrac beef can produce a carcass with a high proportion of muscle tissue.

Muscle tissue is the main source of meat, and a high proportion of muscle tissue in the carcass can result in a higher meat yield, which can be economically beneficial for meat producers. However, it is important to consider other factors such as meat quality, which can also influence the value of the meat produced. Aubrac beef can produce a carcass with a relatively high proportion of muscle tissue, which can be a desirable trait for meat production.

The reported values for bone percentage in Aubrac beef suggest some variation between studies, with values ranging from  $15.4 \pm 1.4\%$  to  $21.7 \pm 1.28\%$ . The highest value is reported by Bakharev et al. (2018), while the lowest value is reported by Piedrafita et al. (2003), and Sheveleva et al. (2021) reported an intermediate value.

The percentage of bone in the carcass is an important morphological parameter that can affect meat yield and quality. High bone percentages can lead to a lower meat yield and a higher proportion of bone-in cuts, which may not be as desirable for consumers. However, some bone is necessary to provide structure and support to the carcass.

It is important to note that the percentage of bone can vary depending on several factors such as age, sex, and diet. Therefore, it is difficult to compare values reported by different studies without considering these factors. Aubrac beef suggest some variation between studies, but the values are generally within the range reported for other beef breeds. It is important to consider the balance between bone and muscle tissue percentages in the carcass to optimize meat yield and quality.

The reported values for total fat percentage in Aubrac beef suggest some variation between studies, with values ranging from  $2.1 \pm 0.31\%$  to  $7.6 \pm 1.7\%$ . The lowest value is reported by Bakharev et al. (2018), while the highest value is reported by Piedrafita et al. (2003), and Sheveleva et al. (2021) reported an intermediate value.

The percentage of fat in the carcass is an important morphological parameter that can affect meat quality, flavor, and tenderness. Low fat percentages may result in tougher and less flavorful meat, while high fat percentages may lead to greasy and less healthy meat.

It is important to note that the percentage of fat can vary depending on several factors such as age, sex, and diet. Therefore, it is difficult to compare values reported by different studies without considering these factors.

Overall, the reported values for total fat percentage in Aubrac beef suggest some variation between studies, but the values are generally within the range reported for other beef breeds. It is important to consider the balance between fat and muscle tissue percentages in the carcass to optimize meat quality and consumer satisfaction (Chambaz et al, 2003; Dubost et al., 2013).

### 3. Chemical composition of the Aubrac meat

Beef is a highly nutritious food that is rich in protein, vitamins, and minerals (Oury et al., 2009). The chemical composition of beef can vary depending on factors such as the breed of

cattle, age, diet, and management practices. Generally, beef contains approximately 75% water, 20% protein, and 5% fat, along with a variety of vitamins and minerals such as iron, zinc, and vitamin B12 (Web & O'Neill, 2008). The protein in beef is considered to be of high quality, containing all of the essential amino acids that humans need for growth and maintenance of bodily tissues (Begoña Panea et al., 2018).

The fat content in beef can also vary, with some cuts being leaner than others. Beef fat is a source of both saturated and unsaturated fatty acids, including the healthy omega-3 fatty acids (Chambaz et al, 2003; Dubost et al., 2013).

The chemical composition of Aubrac meat has been studied in various research articles. Generally, beef meat consists of water, protein, fat, and ash, as well as some micronutrients such as vitamins and minerals.

Table 5. Physico-chemical composition of Aubrac beef

Parameters	Value ( $\bar{x} \pm S\bar{x}$ )	References
Protein %	22.20	Attilio L. Mordenti
	19.41 ± 0.36	Bakharev A. A.
	23.23 ± 0.34	Vigilijus JUKNA
Dry matter %	20.8 ± 0.37	Bakharev A. A.
	25.43 ± 0.23	Vigilijus JUKNA
	30.63	Attilio L. Mordenti
Fat %	1.03 ± 0.05	Vigilijus JUKNA
	0.33 ± 0.07	Bakharev A. A.
Ashes %	1.17 ± 0.11	Vigilijus JUKNA
	1.05 ± 0.07	Bakharev A. A.
Cooking loss %	23.6	Attilio L. Mordenti
	26.53 ± 1.85	Vigilijus JUKNA
Drip loss %	0.39	Attilio L. Mordenti
	4.04 ± 0.18	Vigilijus JUKNA

The protein content of beef is an important nutritional parameter that contributes to the quality and value of the meat. The values reported for Aubrac beef are within the expected range for high-quality beef, with protein content ranging from 19.41% to 23.23% (Table 5). The protein content is influenced by various factors, including genetics, age, sex, and nutrition

Based on these values, Aubrac beef seems to have a relatively high protein content compared to other beef breeds. The protein content is an important indicator of the quality of meat, as it is essential for building and repairing muscle

tissues. However, it is important to note that the protein content may vary depending on various factors such as age, gender, diet, and management practices. Therefore, it is necessary to consider these factors when interpreting the protein content of beef.

Based on the information provided, it seems that the authors have measured the dry matter percentage in beef Aubrac and reported their findings.

The dry matter percentage is the amount of solid material remaining after all the water has been removed from a sample. It is an important



parameter in determining the nutritional value and quality of animal feed and food products.

The reported values for the dry matter percentage in beef Aubrac are as follows: Bakharev A.A. et al., 2018:  $20.8 \pm 0.37\%$ ; Vigilijus Jukna et al., 2017:  $25.43 \pm 0.23\%$ ; Attilio L. Mordenti et al., 2019:  $30.63\%$ .

It is difficult to comment on these values without more information on the methodology used to measure the dry matter percentage, the sample size, and the variability of the samples. However, it is clear that the values reported by the authors are different from each other, suggesting that there may be variability in the dry matter content of beef Aubrac depending on various factors such as the age, breed, diet, and management of the animals.

Dry matter percentages provide useful information for researchers, producers, and consumers interested in the nutritional value and quality of beef Aubrac. However, further studies and analyses may be needed to fully understand the variability and determinants of dry matter content in this type of beef.

The reported values indicate that there is a significant difference in the fat content of beef Aubrac between the two authors. Vigilijus JUKNA reported a much higher fat percentage than Bakharev A. A. In addition, the standard deviations of the measurements also suggest that there is variability in the fat content of beef Aubrac.

The difference in the reported values could be due to various factors such as differences in the age, breed, diet, and management of the animals used in the studies, as well as differences in the methodology used to measure the fat content.

It is important to note that the fat content of beef Aubrac is an important nutritional parameter, as it affects the flavor, tenderness, and overall quality of the meat. Consumers and producers may be interested in the fat content of beef Aubrac for various reasons, such as for health and dietary considerations, as well as for marketability and quality control.

The reported values for cooking loss percentage in beef Aubrac are as follows: Mordenti:  $23.6\%$ ; Vigilijus:  $26.53 \pm 1.85\%$

The cooking loss percentage is a measure of the amount of weight lost during cooking due to the evaporation of moisture. It is an important parameter in determining the yield and quality

of meat products, as well as the sensory properties such as texture and juiciness (Listrat et al., 2016).

The reported values indicate that there is a difference in the cooking loss percentage between the two authors, with Vigilijus reporting a slightly higher cooking loss percentage than Mordenti. The higher cooking loss percentage reported by Vigilijus may be due to various factors such as the age, breed, diet, and management of the animals used in the study, as well as the cooking method and conditions.

The reported values provide useful information for researchers, producers, and consumers interested in the yield and quality of beef Aubrac. However, it is important to note that further studies and analyses may be needed to fully understand the determinants of cooking loss in this type of beef and to provide more accurate and consistent measurements.

The reported values for drip loss percentage in beef Aubrac are as follows: Mordenti:  $0.39\%$ , Vigilijus:  $4.04 \pm 0.18\%$ .

Drip loss percentage is a measure of the amount of moisture that is lost from the meat during storage or refrigeration, and it is an important parameter in determining the quality and shelf-life of the meat.

The reported values indicate that there is a significant difference in the drip loss percentage between the two authors, with Vigilijus reporting a much higher drip loss percentage than Mordenti. The higher drip loss percentage reported by Vigilijus may be due to various factors such as the age, breed, diet, and management of the animals used in the study, as well as the processing and storage conditions.

It is important to note that high drip loss percentage can negatively affect the quality and shelf-life of the meat by reducing its juiciness and tenderness. Therefore, the reported values provide useful information for producers and consumers interested in the quality and shelf-life of beef Aubrac.

## CONCLUSIONS

We can conclude that Aubrac cattle are a breed primarily raised for beef production. They are known for their moderate growth rate and efficient conversion of forage into meat. During

the period of 0-6 months, female Aubrac cattle have an average daily weight gain of 716 grams, while males of the same age have an average daily weight gain of 743 grams. However, the difference in weight gain between males and females is relatively small and can be influenced by genetics, hormonal differences, feeding practices, and social dynamics.

To promote healthy growth and development of Aubrac cattle, farmers and ranchers must provide them with a balanced diet that meets their nutritional needs. Regular weighing of the animals can help to monitor their growth and ensure that they are on track to meet production goals. Overall, Aubrac cattle are a hardy and adaptable breed that can thrive in a variety of environments and management systems, making them a popular choice among beef producers.

Aubrac is a breed of cattle that is highly valued for its meat quality. The breed is known for producing meat with a high percentage of protein and a low percentage of fat, which makes it a healthy and nutritious food option. Additionally, Aubrac beef has a high slaughter yield and a good amount of muscle tissue, which is desirable for meat production.

Furthermore, the data presented suggest that Aubrac cattle have a good growth rate and can reach significant live weights at relatively young ages, making them a promising breed for meat production. However, it is important to note that some of the values presented vary across studies and may be influenced by factors such as feeding practices and breeding programs.

Overall, the information indicates that Aubrac is a breed with good meat quality and production potential, but further research is needed to fully understand the characteristics and potential of this breed.

## REFERENCES

- Astruc, T. (2014). *Connective tissue: structure, function and influence on meat quality*. In *Encyclopedia of Meat Science*, C. D. M. Dikeman, 321–328, Oxford, UK: Elsevier Publishing House, 2nd edition;
- Bakharev, A.A., Sheveleva, O. M., Fomintsev K.A., Grigoriev K. N (2018a). Productive Qualities of Beef Cattle Breeds in the conditions of the Southern Trans-Urals. *Advances in Engineering Research*, 151.
- Bakharev, A.A., Sheveleva, O. M., Fomintsev, K. A., Grigoryev, K. N., Koshchayev, A. G., Amerkhanov, K. A., & Dunin, I. M. (2018b). Biotechnological Characteristics of Meat Cattle Breeds in the Tyumen Region. *J. Pharm. Sci. & Res.*, 10(9), 2383-2390.
- Begoña, P. et al. (2018). Effects of breed-production system on collagen, textural, and sensory traits of 10 European beef cattle breeds. *Journal of Texture Studies*, doi: 10.1111/jtxs.12350.
- 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.
- 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;
- Dubost, A., Micol, D., Meunier, B., Lethias, C., & Listrat A. (2013). Relationships between structural characteristics of bovine intramuscular connective tissue assessed by image analysis and collagen and proteoglycan content. *Meat Science*, 93(3), 378–386.
- Esteve, P., & Bouchy, R. (2002). Productivite de trois races bovines francaises, Limousine, Charolaise et Salers. *INRA Productions Animales*, 15, 293-312.
- 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.
- Listrat, A., Leuret, B., Louveau, B., Astruc, T., Bonnet, M., Lefaucheur, L., Picard, B., & Bugeon, J. (2016). How Muscle Structure and Composition Influence Meat and Flesh Quality. *The Scientific World Journal*, 14.
- Mădescu, B.M., Lazar, R., Neculai Valeanu, A.S., Porosnicu, I., & Boisteanu, P.C. (2022). Body measurements on the aubrac cattle breed: a review. *Scientific Papers Animal Science and Biotechnologies*, 55(2).
- Mayonnave, G.S., Oliveira Mello, R., Nunes Vaz, F., Manetti de Ávila, M., Pascoal, L.L., & Trindade, R.A.C. (2020). Physicochemical characterization of by-products from beef cattle slaughter and economic feasibility of commercialization. *Acta Scientiarum. Animal Sciences*, 42.
- Mădescu, B.M., Lazăr, R., Ciobanu, M.M., & Boișteanu, P.C. (2021). Morpfo-Productive Characteristics Of Aubrac Cattle Breed: A Sistematic Review. *Scientific Papers. Series D. Animal Science, LXIV*(2).
- Mordenti, A.L., Brogna, N., Canestrari, G., Bonfante, E., Eusebi, S., Mammi, L.M.E., Giaretta, E., & Formigoni, A. (2019). Effects of breed and different lipid dietary supplements on beef quality. *Japanese Society of Animal Science, Anim. Sci. J.*, 1–9.
- 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.
- Paula, N.F., Tedeschi, L.O., Paulino, M.F., Fernandes, H.J., & Fonseca, M.A. (2013). Predicting carcass and body fat composition using biometric measurements

- of grazing beef cattle. *Journal of Animal Science*, 91(7).
- Piedrafitá, J., et al. (2003). Carcass quality of 10 beef cattle breeds of the Southwest of Europe in their typical production systems. *Livestock Production Science*, 82, 1–13.
- Purslow, P. (2005). Intramuscular connective tissue and its role in meat quality. *Food Science*, 70, 435–447.
- Sheveleva, O.M., Bakharev, A.A., Lysenko, L.A., & Chasovshchikova, M.A. (2021). Exterior features and meat productivity of Aubrac breed cattle during acclimatization in the conditions of Northern Trans-Urals. *E3S Web of Conferences*, 254, 08004.
- 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.
- 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.
- Vigilijus, J., Česlovas, J., Vaidotas, P., Meškinytė-Kaušilienė, E., & Pečiulaitienė, N. (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.