

## LIMOUSIN BREED – CREATION, APPROVAL, SPECIFICATIONS AND CHALLENGES. REVIEW

Miroslav HRISTOV<sup>1</sup>, Nikolay MARKOV<sup>2</sup>, Tsvetelina DIMITROVA<sup>2</sup>,  
Lora MONDESHKA<sup>2</sup>, Svetoslava STOYCHEVA<sup>2</sup>

<sup>1</sup>Research Institute of Mountain Stockbreeding and Agriculture,  
281 Vasil Levski Str., 5600, Troyan, Bulgaria  
<sup>2</sup>Agricultural Academy, Sofia, Bulgaria

Corresponding author email: m\_hristov1@abv.bg

### Abstract

*Limousin is a cattle breed created and selected in France, more than 150 years ago in the region of the cities of Limoges, Albussac, La Courtine in the regions of Limousin and Marche that are part of the central massif of southwestern France, through artificial and natural selection, by the way of selection of the local Blonde d'Aquitaine, distinguished by a rough constitution and used for work. Local natural and climatic conditions affected on its creation. The aim of the present study was to analyze the creation, consolidation, exterior and constitution and related selection, available gene pool and the trend of distribution of Limousin breed worldwide, in Europe, and particularly Bulgaria. This is a breed with excellent meat production qualities. The cattle of this breed are unpretentious in feeding and care, having good utilization of pastures, and have normal fertility. They are resistant to diseases, and show intensive growth. They are used for the production of lean, high-quality beef and for industrial cross-breeding. The study is based on analysis of scientific developments and concepts dedicated to beef cattle breeding. General scientific research methods, information-logical analysis of scientific and scientific-practical information were used as methodological basis for its implementation.*

**Key words:** breeds, consolidation, constitution, exterior, trends.

### INTRODUCTION

#### Historical data on the creation of the breed.

This breed is not called 'the butcher's breed' by accident. Chefs also appreciate meat for its low surface fat and marbling. The history of the breed is believed to be as old as the history of Europe. Rock paintings found in the cave of Lascaux, near Montignac, depict tours likened to the contemporary Limousin breed. Recent DNA studies of European and Eurasian cattle, as well as fossils found at various archaeological sites, show that Limousin, Gascon, Aubrac, Salers and Charollais breeds have a common ancestry linked to cattle that lived in past geological periods in Eurasia. Limousin is a cattle breed created and selected in France, more than 150 years ago in the region of the cities of Limoges, Albussac, La Courtine in the regions of Limousin and Marche, a part of the central massif of the Southwestern France, using artificial and natural selection, by the way of selection of the local Blonde d'Aquitaine, distinguished by

rough constitution and used for work. That is a specific administrative region characterized with harsh winters, poor stony soils, sloping and rough terrains and scarce pastures.

Astigariaga and England (2005) indicated that the region is located at 45.69° latitude and 1.62° longitude. The altitude is 350 m. The population is about 137,000 people. The city of Limoges, which is the administrative center of the district, was founded by Emperor Octavian Augustus in the 1<sup>st</sup> century. This area is known for its well-developed animal husbandry.

Lafarge (1698) reported that Limousin oxen were universally known and respected as pack animals. At the end of their lives, they were usually fattened and used for slaughter and food.

The first written evidence of the existence of Limousin breed dates back to the end of the 18<sup>th</sup> century. In the first half of the 19<sup>th</sup> century, the selection was carried out systematically to increase the meat-producing qualities and turned the breed into a combined one for work, milk and meat. In 1770, Lieutenant general

Antoine de Sartini, police commandant of Paris sent a letter asking – Can he count Limousin oxen after Easter?

In 1791, Jacques-José Saint-Martin, an agronomist by profession, realized the great significance of Limousin breed for the markets of the following cities: Paris, Lyon and Toulouse. Subsequently, it gradually began to improve and develop as a meat-producing breed. Charles de Luobari and his shepherd Roer, through systematic selection, developed the selected Limousin herd in the period 1854-1896, which won 265 ribbons in the prestigious breeding competition of the city of Bordeaux. In 1856, the first herd book of the Limousin breed was registered by Louis Michel. Annual national competitions for the best specimens began. The selection was carried out in a planned way, with an evaluation of fathers for the quality of the offspring. In 1914, the total number of animals registered in the book was 5,416. The book was reorganized twice in 1923 and 1937. In 1926, a closed herd book began to be kept. From July 2007 to June 2008, in connection with the Legislation of the European Union, under increased pressure from French farmers, according to the requirements of the European Association Limousin-EUROLIM, having 11 countries as members, a planned restructuring of the herd book was carried out. In France, 4.1 million beef cattle are raised, 25% of which are of Limousin breed. The number of Limousin cows in the country is about 1 022,000. The controlled Limousin cows are 131,000. There are 51,000 registered in the herd book. Due to its qualities, Limousin cattle breed has received awards at prestigious competitions, such as the title 'Good European Cow', the main prize 'Cup for Good Meat' at the general agricultural competition in Paris in 2003.

There are many associations of Limousin breed, such as: Limousin Cattle Group France, Swedish Limousin Association, British Limousin Cattle Society, North American Limousin Foundation, Canadian Limousin Association, Columbia Limousin Association, Australian Society of Limousin Breeders, Texas Limousin Association, Bundesverbndnes Deutscher Limousinzucher, Associacao Brasileira doc Criadores de Limousin, Irish

Limousin Association, Hungarian Limousin Association, etc.

In Bulgaria, about 5,500 purebred Limousin cattle are bred. There are 3,300 controlled cows. The control is carried out by two breeding associations: National Association for Beef Cattle and Association for Breeding Beef Cattle Breeds in Bulgaria (Nikolov & Karamfilov, 2021).

The purpose of the present study was to investigate the main elements of the breeding of Limousin beef cattle breed raised under different technologies, around the world, in Europe and in Bulgaria.

## **MATERIALS AND METHODS**

The study is based on an analysis of scientific developments and concepts dedicated to Limousin beef cattle. As a methodological basis for conducting the study, general scientific research methods, information-logical analysis of scientific and scientific-practical information, as well as materials for marketing research on the market of different cattle breeds and crossings in beef cattle breeding were used. Descriptive, monographic and retrospective analyses were also provided. To achieve this goal were used summarized data concerning Bulgarian, European and worldwide cattle breeding in the period 2010-2021. The information used is mainly referred to publications of the FAO, Ministry of Agriculture, Food and Forestry (MAFF), Department of Agrostistics, agricultural reports. The paper cites pieces of scientific works by Bulgarian and foreign authors. Summaries and conclusions were made.

## **RESULTS AND DISCUSSIONS**

### **Growth and development**

Growth is increasing the body proportions, through the deposition of structurally and functionally, full-fledged live weight. Weight development is a major, decisive factor for cattle meat productivity. The study of weight and linear development is of great significance for the breeding process (Karamfilov, 2020).

Koots (1994) analyzed published genetic evaluations as a parameter for beef production traits. According to him, low to moderate

heritability was observed in weaning calves at a given live weight.

Gordyyanets (2010) found that calves from local genotypes showed an advantage compared to calves from milk productivity, significantly more efficiently using one kilogram of fodder to obtain one kilogram of growth.

Limousin breed is characterized by a harmonious physique, strong constitution and good growth capacity. It is a leader in the efficiency of muscle growth. It has a fine head with a broad forehead. The breed has horns, but hornless individuals are also found. The chest is wide, but not deep enough. The back is broad and flat. The body has well-defined carnivorous forms. The abdomen is voluminous but tight. The skin is colourless, fine and elastic. The hair coat varies from golden beige, fawn to brownish red, with light, white areas around the eyes, and muzzle and belly and groin. It is not pretentious in terms of feeding and rearing (Panayotova, 2011; Kosilov et al., 2013; Gorinov & Lidzhi, 2016).

Karlikov (2010) reported that the linear evaluation of exterior is moderately inherited ( $H = 0.32$ ). According to Sinivirski (1988), the most common exterior defects for Limousin breed are saddle back, weak hind limbs and delicate bone system.

The live weight standard of Limousin breed shows that female animals reach 650-700 kg. The maximum weight achieved in a cow is 950 kg. Bulls weigh 900-1100 kg. The maximum weight achieved by a bull is 1560 kg. The age of first calving is 24-30 months. The weight of calves at birth varies between 36-40 kg. The weight of a 120-day-old male calf is 165 kg. The weight of female calves at 210 days is 242 kg. The weight of male calves at 210 days is 268 kg (Panayotova, 2011, Nikolov & Karamfilov, 2021).

Marcés et al. (2001) analyzed the genetic parameters of live weight at weaning in Limousin calves. Data from this study were obtained from 41 calves born to 50 Limousin heifers and cows raised in the Samaiayuca desert in Mexico. The animals were pasture-raised. The results of the analysis are as follows: the average live weight at weaning of calves from Limousin heifers was 204.31 kg. The weight of calves obtained from cows

varied from 207.79 to 215.06 kg. Female calves were lighter than males by 5.7-5.9%. The heritability value of the weaning trait at certain live weight is  $H = 2.23 \pm 0.006$ .

The live weight standard of Limousin breed shows that female animals reach 650-700 kg. The maximum weight achieved in a cow is 950 kg. Bulls weigh 900-1100 kg. The maximum weight achieved by a bull is 1560 kg. The age of first calving is 24-30 months. The weight of calves at birth varies between 36-40 kg. The weight of a 120-day-old male calf is 165 kg. The weight of female calves at 210 days is 242 kg. The weight of male calves at 210 days is 268 kg (Panayotova, 2011, Nikolov & Karamfilov, 2021).

Marcés et al. (2001) analyzed the genetic parameters of live weight at weaning in Limousin calves. Data from this study were obtained from 41 calves born to 50 Limousin heifers and cows raised in the Samaiayuca desert in Mexico. The animals were pasture-raised. The results of the analysis are as follows: the average live weight at weaning of calves from Limousin heifers was 204.31 kg. The weight of calves obtained from cows varied from 207.79 to 215.06 kg. Female calves were lighter than males by 5.7-5.9%. The heritability value of the weaning trait at certain live weight is  $H = 2.23 \pm 0.006$ .

Sudarev (2010) analyzed the birth weight, at 18 months and in adults of Hereford, Limousin and Charollais breeds in relation to the acclimatization abilities of the animals in the Tver region and the role of the breeds in industrial cross-breeding.

Panin (2010a) studied the growth dynamics of experimental animals in the harsh continental climate of the South Urals, Russia, and found that industrial cross-breeding created new opportunities to increase productive qualities. Three groups of 10 bulls were formed. In the 1<sup>st</sup> group there were Limousin bulls, in the 2<sup>nd</sup> one some crossings of first generation of Simmental x Limousin, in the 3<sup>rd</sup> group there were Simmental bulls. Until the age of 8 months, the calves were reared on the pasture according to the classic 'cow-calf' technology. The growth indices of the experimental calves were studied monthly. Feeding was according to certain rates.

Table 1. Live weight at different ages of beef breeds in the Tver region according to Sudarev (2010)

Breed	At birth		At 18 months	Adult animal		Yield %
	Female	Male		Cows	Bulls	
Hereford	32	28	475	575	900	58-62
Limousin	42	35	525	550	1,050	60-70
Charollais	43	37	575	750	1,100	60-70

The data given in the table above (Table 1), shows the author's conclusion that calves live weight at birth was almost the same 26.7-32.6 kg. There were some differences in live weight of 2-month-old calves.

The difference between purebred animals and bulls of 1<sup>st</sup> and 3<sup>rd</sup> group is 6.2 kg, or 22.1% (P<0.99) in favour of Limousin.

Crossings took an intermediate position between them with 2.0 kg, or 2.9% compared to the Simmental breed (P<0.95) and 4.2 kg, or 5.5% compared to the Limousin. During the entire experiment, the highest increase was found in the Limousin breed. 4-month-old calves surpassed their Simmental peers by 7.7 kg, or 6.5% (P<0.99) and the crossings by 4.4 kg, or 3.7% (P>0.95). 6-month-old Limousin bulls reached a live weight of 181.4 kg, and surpassed the crossings, their peers by 5.1 kg or 2.9%, the Simmental bulls by 11.3 kg or 6.6% (P>0.95). 8-month-old Limousin bulls surpassed the crossings and Simmental calves – by 9.9 kg, or by 4.2%, respectively (P>0.99).

10-month-old animals in 1<sup>st</sup> group (Limousin breed) surpassed the bulls in 2<sup>nd</sup> group (crossings) and 3<sup>rd</sup> group III (Simmental breed), respectively by 12.9 kg or 4.4% (P>0.95) and 25.5 kg or 9.2% (P>0.99).

The same difference among groups was preserved for 12-month-old animals and the live weight was as follows: 1<sup>st</sup> group – 372.7 kg, 2<sup>nd</sup> – 344.3 kg and 3<sup>rd</sup> – 329.4 kg. The experimental 14-month-old bulls in the 1<sup>st</sup> group surpassed their peers from the 2<sup>nd</sup> group by 43.4 kg, or 10.7% (P>0.99), from the 3<sup>rd</sup> group by 65.0 kg, or 16.9% (P>0.999). In 16-month-old bulls, the superiority increased and represented 51.0 kg., or 11.0% (P>0.999) and 80.1 kg, or 18.5%, respectively.

They surpassed their peers from the other two groups, as and in the previous age periods with 87.0 kg, or 17.9% (P>0.999) and 55.0 kg, or 10.6% (P>0.999), respectively. The author's main conclusion is that Limousin bulls in the conditions of a sharply continental climate show higher absolute growth and high growth

intensity compared to their crossings and peers from the Simmental breed.

Laninoy (1973) reported that Limousin breed has excellent meat-producing qualities. Cattle of this breed are considered as unpretentious in feeding and care, having good utilization of pastures and having high fertility. They are resistant to diseases and show intensive growth. They are used for the production of lean high-quality beef, as well as in hybridization schemes as a sire breed, providing easy calving and excellent quality indicators.

Akhmetov (2005) claimed that purebred Limousin animals in Russia were 2,114 or 1.4% of the total population of the Russian Federation. 597 cows, 958 bulls, 393 heifers and 306 calves were bred in the country. They are mainly used for industrial cross-breeding with Black-and-White and Simmental cattle, as the resulting F1 crossings form a meat-producing herd and are crossed with the Charollais and Blonde d-Aquitaine, and the males are fattened. The purebred assessed cows showed in the first year live weight of 492 kg, as it was in the 537 kg in the second, and in the third 597 kg. The weight of the bulls was 958 kg. Pedigree male calves from the state farm 'Kumskoi', in the city of Stavropol, showed average daily gain of 1,301 g and weight of 453 kg at 12 months age.

Umnov (2005) found that from crossings of Black-and-White cows with bulls of Limousin breed, young animals with intensive growth and good meat productivity were obtained. Male crossings at 15 months reached a weight of 490.4 kg and by this indicator they exceeded the control group of their peers by 22.5 kg.

Gizatullin & Khaziakhmetov (2010) observed good heterosis effect, intensive growth, high meat productivity and fodder utilization in crossings of Black-and-White, Simmental in Bestuzhev cattle with Limousin bulls in Bashkortostan. Crossings surpassed the maternal forms of their peers by up to 20% in terms of live weight, 8-12% in terms of warm carcass, and feeding costs are reduced by 6-10%.

Smirnova (2010) studied fattening results of Hereford, Aberdeen Angus and Limousin beef male calves in the Leningrad Region. The average live weight of Limousin calves was 520 kg at 18 months, which is 66 kg more than Hereford calves and 144 kg more than Aberdeen Angus.

Gudymenko et al. (2010) conducted an experiment with bulls from Limousin, Aubrac and Simmental breeds. Three groups of 15 animals were formed. The animals were purebred and reared on deep permanent litter, according to the technology. The calves were selected from cows that gave birth in the autumn-winter season. Until the age of 7 months, the calves were raised with their mothers on the pasture, and from 7 to 18 months they were fattened on specialized feeding grounds. The feeding was full, and the daily ration was according to Kalashnikov standards (2003). The ration structure was the same for all animals. The calves, depending on the genotype, reacted differently to the environmental conditions, which had an impact on their live weight. In the analysis made by the authors, it can be seen that 15-month-old bulls from Limousin and Aubrac breeds exceeded Simmental breed by 25.8 kg or by 6.2%. Limousin and Aubrac animals are characterized by compactness and well-developed musculature and meat forms.

Videv et al. (2001) reported that while crossing Bulgarian Brown cattle x Limousin x Charollais, animals are obtained for fattening with high average daily gain of 1200 g, and the best individuals in the experimental setup gave 1400-1500 g and were realized as bulls for industrial cross-breeding.

Gordynec et al. (2010) reported that the economic efficiency in breeding Limousin calves and its crossings with Black-and-White cattle and Maine-Anjou is higher compared to calves from dairy breeds, and it shows that calves with meat genotype have higher growth and fodder utilization as a result. 5.5-6-month-old Limousin calves and their crossings showed high growth energy and high average daily gain. They surpassed Black-and-White calves by 23%, Limousin x Black-and-White cattle by 8%, and Limousin x Maine-Anjou crossing by 12%.

## **Fertility**

A significant indicator predetermining the production of meat from the population as a whole is the number of calves obtained and weaned.

Petrushko (2010a) reported that the fertility of the Limousin breed was 98%, and in individual herds it reached up to 100%. Limousin cows had normal fertility, and in three-year-old cows, fertility sometimes reached 100%. Calves were extremely light compared to other breeds.

Dop (2009) indicated the following fertility of cows from different breeds: Limousin – 98%, Hereford – 94%, Charollais – 91%. Limousin cows generally had longer gestation period of 287-297 days. Perinatal mortality in France for Limousin cattle was only 3%. The interval between calving and first mating period greatly affects fertility. He considered that the average interval should be about 60 days for mature cows and about 80 days for two-year-old cows. With good feeding, this interval is usually short, and with bad nutrition, it is significantly extended. Spring-calving herds had higher overall fertility level than autumn-calving herds except when hay was limited to 40% (Todorov, 2001).

Panin (2010a) concluded that Limousin cows in the Southern Urals are distinguished by good fertility, which shows regularity in calving. Calving interval was 380 days, which was 77.6% in pedigree herds. 94.8 calves were obtained from 100 cows. Difficult births were 1.7%

## **Meat productivity**

The quantitative and qualitative indicators of meat productivity in cattle are the following: breed and individual characteristics of animals, breeding technology and other non-hereditary factors.

Sinivirski (1988) considered that breed affiliation has great significance for the quantity and quality of beef. Specialized beef breeds mature earlier, fatten better and have higher meat quality than dairy breeds. The same author expressed the opinion that in cattle with the advancing age there are significant changes in metabolism, in the establishment of nutrients and in the intensity of growth. The consumption of nutrients per 1 kg of gain gradually increases. With advancing age, the

slaughter yield increases, the amount of fat and energy content in the meat decreases, the number of bones in the carcass decreases, the tenderness and juiciness of the meat deteriorates, and the taste improves.

During the creation and improvement of Limousin breed, meat productivity was the main, essential feature.

Levantin (1996) found that high growth intensity, low fat content and high muscle tissue content in the carcass characterize the French-Italian breeds, as one of them is Limousin.

Pitchford (2008) commented on the values of the F94L gene. The author made the following conclusions:

- This gene produces 20% more meat on the same amount of food;
- The gene increases the tenderness of the meat by 15%;
- The gene is of very high purity in animals of Limousin breed, but of very low purity in the others.

In studies in Adelaide, Australia, they found changes in myostatin *CRC3* under the influence of the F94L gene. This gene occurs at very high frequency in Limousin cattle and does not affect light calving and fertility. A highly resistant form of the gene is with prevalence of 83% in Limousin and only 3% in Belgian Blue, 0.6% in Aberdeen Angus and 0% in Hereford. The 83% prevalence gives reason to believe that 69% of all individuals are homozygous for this trait, 28% are heterozygous and only 3% do not carry this gene. Animals carrying the gene showed 13% higher muscle eye size and 4.4% higher meat quality.

The yield was 64-67%, muscle/fat ratio was 7, muscle/bone ratio was 4.7 according to Dop (2009).

Petrushko (2010b) reported that meat of Limousin cattle was with thin fibres, tender, juicy, well-marbling, tender and tasty. Meat productivity of calves was 75%, Category E and U according to the European classifications.

For 1 kg of bones, there were 6.5 kg of meat. The meat content of the carcass varied between 82-83%. Filippova (2009) stated that fat content in the meat was 7-10%, and protein content was 19-20%.

According to the American Herd Association, one-three-ounce serving of lean Limousin beef contains an average of 73 mg of cholesterol.

The same measure of chicken contains 76 mg of cholesterol, pork has 77 mg of cholesterol, fried shrimp has 178 mg of cholesterol, and one egg has 274 mg of cholesterol.

According to a study by the University of Texas at Iowa, Limousin meat contains significantly less fat, 2.43%, instead of 6.37%, which is found in other beef cattle breeds. This represents an impressive 61% reduction in fat. It is said that in a study among five beef breeds, Limousin meat is first in tenderness and juiciness, and equal in taste among others.

Mokhov and Sharokin (2007) reported that beef contains: muscle tissue 64.5-72.3%, fat tissue 10.4-12.9%, connective tissue 9.3-10.1%. 100 g of beef contain from 100 to 196 Kcal. or 410-804 KJ.

Ivanov et al. (2001) studied the fattening of female calves of Black-and-White breed and crossings between Limousin and Brown breed. Upon reaching 400 kg of live weight, calves were slaughtered and a full slaughter analysis was performed. Calves from the 2<sup>nd</sup> group gave 10.7% higher average daily gain. They also had better slaughter performance.

Bikbulatova (1998) conducted a series of experiments on fattening male calves from Limousin, Simmental, Bestuzhev and Black-and-White cattle breeds. 18-month-old calves from Limousin breed reached weight of 638 kg, which was by 48.8 higher than their peers from the Simmental breed, by 87.7 kg than their Black-and-White cattle peers and by 59 kg compared to Bestuzhev breed.

Vinogradov (2007) reported that in November 2006 to March 2007 he studied 170 Aberdeen Angus and Limousin calves obtained by embryo transfer. The objective of the study was to observe the live weight and growth dynamics in transplant calves. The experiment was conducted in Samara Region, Nefrostorsky District. During the conducted research, different live weight was found between female and male calves. For Aberdeen Angus it was 4.1 kg or 14% in favour of male individuals, and for Limousin – 2.8 kg or 12.7% also in favour of male calves. The live weight of male calves at birth was 32.3 kg, and that of females – 28.2 kg. The calves felt well and did not suffer from dyspepsia or pneumonia. The average daily gain of 6-month-old calves of

Aberdeen-Angus breed was 1138 g and 1087 g for Limousin breed.

According to Panin (2010b), the slaughter indicators of 15-month-old Limousin bulls are as follows:

Live weight, kg	572.6
Pre-slaughter, kg	561.0
Carcass weight, kg	344.2
Pure meat, %	61.3
Weight of internal fat, kg	22.1
Percentage content of internal fat	3.9
Meat in the carcass, kg	366.3
Meat in the carcass, kg	65.2

According to Hakimov (2011), 15-month-old transplant Limousin bulls had the following slaughter parameters:

Pre-slaughter, kg	531.7
Carcass weight, kg	311.2
Meat in the carcass, kg	58.6
Weight of the internal weights, kg	14.5
Percentage content of internal fat	2.74
Meat in the carcass, kg	325.8
Meat in the carcass, %	61.3
Meat in the half carcass, kg	150.8
Meat in the half carcass, kg	122.7
Meat in the half carcass, kg	81.4
Bones, %	15.8
Tendons and ligaments, kg	3.90
Tendons and ligaments, kg	2.60
Ratio of edible and inedible parts	4.35

The above-mentioned data testify to obtained meat with good nutritional qualities and technological indicators. The good culinary properties, the energy value, the high content of protein and amino acids distinguish Limousin breed as one of the leaders among modern beef breeds.

### **Milk productivity**

Milk productivity is a function of the mammary gland, the development and action of which is controlled by the Central Nervous System. Milk yield of cows is a significant trait of economic importance, determining to a large extent the live weight of calves until weaning. There is a high value of positive correlation between milk productivity of beef cows and their 3-month-old calves ( $H = 0.69-0.75$ ) and calf growth and fodder consumption ( $H = 0.51-0.69$ ).

Mokhov and Sharohin (2007) reported that cow's milk has the following composition: 88.5% water, 3.1% proteins, 3.5% fat, 4.7% milk sugar, 0.7% mineral substances, ferments, etc. 100 g of milk contains 58 Kcal or 238 kJ.

The main method of determining milk yield of cows in beef cattle breeding is the control weighing of calves before and after lactation. Using this method, they found that the average daily milk production of Limousin cows was 5.99 kg, and it changed in June and September, as in individual cows it fluctuated from 1.8 kg to 9.1 kg daily milk yield. The most common method of milk yield research in beef cattle is manual milking, after intravenous administration of 10 IU oxytocin, one minute before milking.

Lanina (1973), Levantin and Smirnov (1970), Cherkashchenko (1975) and Prakhov (1975) expressed the milk productivity of beef cows in terms of absolute or equivalent live weights of calves at weaning. They recommend to assess the mothers according to calf live weight at weaning, citing that the correlation coefficient between calf live weight at weaning and maternal milk yield is relatively high.

Lowson (1981) noted that calf live weight at weaning was closely related to the availability of pasture and concentrate feeding. He reported that the correlation between calf live weight at the age of 100 days and maternal milk yield ( $r = 0.85$ ) is much greater. At this age, the assessment is less affected by nutrition.

Lowson (1982) believed that when evaluating cows, milk yield should be adjusted for milk composition. He used a formula to calculate the milk weight, where 1 lb of adjusted milk contains 340 Kcal of energy. The author found that milk productivity, and hence calf weight at weaning depends the most on the conditions of the year (the availability of pasture). This affects both the total productivity of milk and its ingredients. The corresponding year also influences with its climatic conditions.

### **CONCLUSIONS**

Limousin breed is with excellent meat production qualities. The cattle of this breed are unpretentious in feeding and care, having good utilization of pastures and have normal fertility. They are resistant to diseases and parasites.

They are characterized by a harmonious body structure, strong constitution and good growth ability.

The breed is a leader in the efficiency of muscle growth. It is used for the production of lean, high-quality beef and veal, as well as for industrial cross-breeding.

It is introduced well on all continents and shows good economic results.

## ACKNOWLEDGEMENTS

I would like to express my gratitude to the management body of the Research Institute of Mountain Stockbreeding and Agriculture in Troyan, for the logistic and material support in the study.

## REFERENCES

- Dop, Zh. (2009). *Potential of French breeds*. KRS, Golden autumn, 11-44
- Gorinov, Y., & Lidzhi K. (2016). Exterior assessment of Limousin cows from different imports. *Bulgarian Journal of Animal Husbandry*, LIII, 3-6.
- Gudymenko, V. (2010). *Features of the growth, development and meat productivity of Simmental, Limousin and Aubrac bulls*. Materials of the international scientific and practical conference, Voronezh - Kursk.
- Karamfilov, S. (2020). Study on the exterior of Hereford cows bred in Bulgaria. *Bulgarian Journal of Animal Husbandry*, LVII, 4, 3-12.
- Karlikov, D. (2010). *Methods of genetic assessment of animals in beef cattle breeding abroad*. First-interregional branch scientific and practical seminar and technologies of beef cattle breeding.
- Kosilov, V., Zadnepryansky, I., Samkhov, N., & Zhukov, S. (2013). *The use of Limousin, Simmental and Beltuzhev cattle in beef cattle breeding*. Orenburg, RU: Orenburg Publishing House, 7-156.
- Nikolov, V., & Karamfilov, S. (2021). *Breeding program of the Limousin breed*. Plovdiv, BG: Academic Publishing House, 20-47.
- Panayotova, M. (2011). *Breeding program of the Limousin breed in Bulgaria*, 4-43.
- Panin, V. (2010a). *Evidence and Approach with Increased Production for a New Year*. Orenburg, RU: Agrarian Science Publishing House.
- Panin, V. (2010b). Growth and development of Limousine bull-calves and crossbreeds with the Simmental breed in the zone of the South Urals. *Agrarian Bulletin of the South-East*, 2, 5
- Petrushko, S. (2010a). On the benefits of beef cattle breeding. *Animal Husbandry and Poultry*, Belarus.
- Petrushko, S. (2010b). Meat breeds of cows. *Livestock and poultry*, Belarus.
- Prakhov, L. P. (1975). *Kazakh white-headed breed of cattle*. Chelyabinsk, Yuzhnouralsk prince. ed., 149.
- Sinivirski, G. (1988). *Handbook of Animal Husbandry*. Sofia, BG: Zemizdat, 66-68
- Todorov, M. (2001). A study of fattening performance and slaughter performance of Hereford and Aberdeen Angus male calves and crossings between them. *Bulgarian Journal of Animal Husbandry*, 3, 3-8.
- Umnov, A. (2005). *Growth and development and meat productivity of bull-calves of Black-and-White breeds and its crosses from Hereford and Limousin with intensive feeding rearing*. Dissertation, 12-39.
- Videv, V., Krastanov, Zh., & Angelova, T. (2001). Economic results of the beef herd of Agrarian Institute of Stara Zagora. *Bulgarian Journal of Animal Husbandry*, 1(2), 5-9.