

QUALITY OF PIG CARCASSES OF DIFFERENT BREEDS AND BREED COMBINATIONSLisitsyn A.B.¹, Tatulov Yu.V.¹, Mittelshtein T.M.¹, Karmysheva L.F.¹, Kolomiets N.N.¹, Griksbas S.A.²¹GNU The All-Russian Meat Research Institute named after V.M.Gorbatov, 109316, Moscow, Russia²Moscow Agricultural Academy named after K.A.Timiryazev, Moscow, Russia**Background**

Highly producing industrially suitable animals, providing high yield of muscular tissue are needed for the intensification of pig husbandry in Russia.

New technologies of raising, specificity and directionality of the genes used in obtaining of new genotypes of animals, improvement of the methods of selection of animals, use of the best breeds of different directions of productivity in the field of production crossing and hybridization influences the ratio of muscular, fatty and bone tissue in the organism, and thus the yield and quality of meat.

A scientific and production experiment involving comparative study of the peculiarities of formation of meat productivity and quality of meat of the genotypes of pigs of different breeds and breed combinations was carried out to select the most promising genotypes of animals.

Materials and methods

To carry out the experimental work four groups of animals were formed: I – Large White (universal), II – Large Black (fat), III – Duroc (meat) IV – Large White x Large Black (hybrid). 42 heads of animals were studied in total.

The quality of meat raw materials was evaluated by the indices characterizing meat productivity: (live weight; weight of warm and chilled carcasses; yield of meat; thickness of fat; length of the carcass) and morphological composition of carcasses.

The thickness of fat was measured in four points: in the area of withers (1), above 6-7 thoracic vertebra (2), at the level of last lumbar vertebra (3) and on the rump (4). Pig carcasses were weighed in warm and chilled condition. For dressing and boning the right sides in chilled condition were used which were divided into four parts: shoulder, rib-belly, back and ham. The yield of muscular tissue, fat, bone and connective tissue was taken into account, together with their ratio in the half carcass of each animal and on the average – on each group of pigs.

The rheological properties of meat were determined by the method of penetration with the use of indenter in the form of cone with the angle $\alpha = 20^\circ$ with the force 0.5 kgf in longitudinal and cross orientation of muscles.

Results of investigations

The results of experimental investigations on meat productivity of pigs show that the largest accepted live weight had the pigs of group I (112.2 kg), which was by 0.4% higher than that of III group, and by 0.3% higher than that of II group and by 6% higher than that of IV group. However, the highest carcass yield was obtained from pigs of II group (Large black) – 69.5%, then – IV group 69.2%, I – 68.6% and III – 67.9%.

The best indices of meat productivity were for the pigs of III group – Duroc: muscle eye area was 45.3 cm², which by 6.5 – 7.6 cm² larger than for the pigs of other groups. The pigs of Large Black breed had the least length of the half-carcass – 99.7 cm) and the muscle eye area (37.7 cm²) and correspondingly were the most fatty.

The quality of pigs carcasses of different breeds and of their hybrids was judged by the indices characterizing both the whole carcass, and its parts (Table I).

The data of morphological composition of carcasses show that Duroc have a higher yield of muscular tissue (55.7% on the average), and less of fatty tissue (32.3%); a significantly less yield of muscular tissue was obtained from carcasses of large Black breed. (48.4%).

Duroc and hybrids had practically the same index of carcasses meatiness, that by 4.49% was higher than that of Large White breed and by 8.39% higher than that of Large Black pigs.

The best leanness index had Duroc pigs, slightly lower – Large White pigs and hybrids and the least – the Large black pigs.

These data suggest that Duroc pigs have the highest indices of appearance and morphological composition of carcasses.

Analysis of the data obtained shows that the Large White pigs had the highest yield of shoulder (36,71%), Duroc – slightly lower (35,48), Large Black – (34,87) and hybrids had the lowest yield (33,09%).

The yield of the ham was the highest with hybrids (31,99%), slightly lower – with the pigs of Large White breed (31,09%). Duroc and Large Black pigs had actually equal yield of ham (30,6 and 30,7%).

The rib-belly part of the pigs of Large White and Large Black breeds was practically equal, slightly higher with hybrids and significantly higher with Duroc pigs.

The yield of the most valuable part of the carcass – the back was the highest for hybrids (17,70%) and for the pigs of Large Black breed (17,49%). The lowest yield had the pigs of Large White breed (15,25%).

As far as the yield of the most valuable parts of the carcass (ham and back) and the index of meatiness are concerned, there are hybrids that had the best indices as compared to pure breed animals. However, they had the inferior index of leanness compared to Duroc pigs.

For the evaluation of meat quality of the studied groups of animals rheological properties were studied by the method of penetration.

The most sensitive from the structural-mechanical characteristics is the maximum shear stress, which can be determined with the help of penetrometer.

The data obtained (Table 2) have shown that the muscular tissue of Duroc breed had the highest value of penetration (169,6 mcm on the average) which indicates its higher tenderness compared to other breeds. The index of penetration of Large White breed was slightly less, and the muscular tissue of two other breeds – Large Black and hybrid was less tender. On the whole such level of penetration suggests a sufficiently high tenderness of muscular tissue of all the studied animals. As to the back fat, its consistency from the pigs of the first and 3rd groups was more dense, lower density was marked with the 4th group of pigs (hybrid of Large White and Large Black): the value of penetration, on the average 123,6 mm; the most soft was the back fat from pigs of the second group (Large Black): the value of penetration – 136,8 mm.

Conclusions

Comparative evaluation of quality of carcasses and meat of pigs of different breeds has shown that Duroc breed stands out on many parameters. The pigs of this group had a greater yield of muscular tissue (55.7%), greater part of eye area, index of meatiness and less thickness of subcutaneous fat and yield of fat tissue.

The Large Black breed of pigs featured a relatively high fatness and has lower indices of whole meatiness - index of meatiness and index of leanness.

For each of the studied breeds of pigs specific features on the yield and ratio of individual parts of carcasses were established that was important and necessary for solving the problems of their purposeful use.

The rib and belly part of the pigs of the Large White and Large Black breeds was actually equal, and was significantly greater for the pigs of Duroc breed.

The yield of the most valuable part of the carcass – the back – was the highest with the carcasses of hybrids (17.70%) and pigs of Large Black breed (17.49%), the lowest – with the pigs of Large White breed (15.25%).

Sufficiently high values of penetration of muscular tissue for all the studied groups of pigs were established suggesting rather a high tenderness of meat.

The characteristics obtained suggest that only differentiated approach to the quality of raw materials with the consideration of breed composition makes it possible to choose the most optimum version of its rational use.

On the whole the obtained results indicate that the use of selection of animals for revealing genetic resources and purposeful rearing of animals with high meaty traits is an important and promising direction both in animal husbandry and in the meat industry.

Besides, the data obtained indicate that special crossing of different breeds can be accomplished with the aim of obtaining the carcasses with pre-determined industrially useful quality, providing possibility of rational, purposeful use of carcasses during industrial processing.

Table 1. Indices of meat productivity of pigs of different breeds and breeds combinations

Breeds	Parts of carcass			
	Shoulder	Ham	Rib and belly	Back
Yield of carcasses parts, %				
Large White	36.71	31.09	16.95	15.25
Large Black	34.87	30.75	16.89	17.49
Duroc	35.48	30.63	17.43	16.46
Large White x Large Black	33.09	31.99	17.22	17.70
Muscular tissue yield, %				
Large White	21.73	18.37	7.07	7.00
Large Black	19.08	16.15	6.22	6.93
Duroc	20.56	19.56	7.74	7.84
Large White x Large Black	19.40	18.92	6.87	8.51
Fatty tissue yield, %				
Large White	9.88	9.06	8.96	5.76
Large Black	10.85	11.36	9.91	8.23
Duroc	10.18	7.53	8.73	5.91
Large White x Large Black	8.94	9.39	9.62	6.70
Index of meatiness				
Large White	4.26	7.71	2.81	5.01
Large Black	3.86	8.11	2.97	4.99
Duroc	4.33	8.04	2.89	5.52
Large White x Large Black	4.08	9.35	3.42	5.15
Index of leanness				
Large White	2.20	0.79	1.22	2.02
Large Black	1.76	0.63	0.84	1.42
Duroc	2.02	0.88	1.32	2.60
Large White x Large Black	2.17	0.71	1.27	2.01

Table 2. Characteristics of consistency of pork from different breeds of animals

Group of animals	Value of penetration $h_{p.av.}$ mm	
	Muscular tissue	Fat
I	163.6	111.0
II	158.2	136.8
III	169.6	113.0
IV	158.7	123.6