

# THE CONSEQUENCES OF MODIFYING MORPHOLOGICAL STRUCTURE OF CARCASSES ON PORK QUALITY

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## Abstract

*This paper systematizes the results of a study, concerning meat quality of swine after modifying the morphological structure of carcasses, under the influence of animal genotype. In this purpose, it was determined the carcasses composition but also physical-chemical properties on meat at different breeds and swine hybrids. It was found that concerning protein content of meat there were not signalized significant differences between breeds and hybrids but there can be noticed growth tendencies of protein quantity on meat types. Reducing the amount of fat at swine carcasses as a result of hybridization contributed to the decrease of intramuscular fat. In a certain manner, this leads to the change of tenderness, succulence and taste quality of meat.*

**Key words:** meat, genotype, breed, carcass, protein

## INTRODUCTION

Nowadays, a permanent preoccupation of nutritionists is the identification of stable sources of protein for the consumption assurance. The use of pork meat in human nutrition helps health maintenance, through high protein content with biological superior value but also through minimum report between thick unsaturated acids and fat acids [1].

The quality of meat represents the degree of satisfaction felt by the consumer when buying, preparing and consuming the product [3]. Due to consumption in fresh state or which is prepared through boiling, drying, smoking the notion of pork meat quality gathers a large number of characteristics and influences the economic interest of implied parts, beginning with the farmer and ending with the consumer. We can notice consumer diversification, the most important being pleasant taste, the lack of preservatives and dyes, freshness, juiciness. Alimentation of swine has a small influence on technological meat qualities, while breed, age and body weight at slaughtering represent the factors that lead to meat quality [4]. Regime corn based diet and animal density do not affect

the organoleptic qualities but contribute to fat intramuscular growth.

## MATERIAL AND METHOD

The research material was considered the pork meat obtained from Large White(I) and Landrace(II) swine breeds and Estonian Bacon (III), Moldavian meat (IV) slaughtered at 20-60-100-120 kg, but also hybrids resulted from mating interracial- Large White and Landrace; Large White and Hampshire; Southern type of meat with Hampshire and Yorkshire. From each lot there were collected three meat tests. For the study of physical-chemical meat properties there were used the following methods: Ph24 (after 24 hours with Ph-meter, the fat thickness, through Soxhlet method, protein method Kjeldhal, humidity was determine by drying tests, the ash by burning tests. The capacity of retaining water was determined using the method of Cirau and Hamm.

## RESULTS AND DISCUSSIONS

The nutritive value of meat is partially influenced by main chemical components like water, protein, fat, mineral substances and vitamins. Protein quantity on pork meat depends on genotype and animals state of fattening. So, on fat swine the protein content is 14-16% but on specialized in production is

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20-22%. This is why, researches concerning meat quality must be connected to morphological structure study of carcasses and chemical composition of meat but also on consequences of their modification based on swine genotype and body weight of young swine at slaughtering. The results obtained can help us on taking decisions regarding the final product which can be prepared from such meat and then forecasting quality based on quantity and quality of nutritional elements (tab. 1).

The results presented in this table prove that changes in morphological structure of

meat, as well as in chemical composition of meat depend on animals age and weight. Meanwhile, there were found differences between breeds concerning main components which characterize the meat quality, which are not so significant, but they can be repeated in swine of all ages and body weight. If at Large White breed the proportion of meat in carcasses decreases significantly from 20 to 60 kg, to 5,46 % at meat breeds, but mostly on Moldavian type of meat, the decrease of content is very small and varies between 0.2%- 2.22%.

Table 1 Carcasses and meat quality based on breed and weight of swine at slaughtering

Lot	Breed	Meat content in carcasses	Chemical composition of meat, %		
			water	protein	thickness
20 kg					
I	Large White	68,66	77,75	19,21	2,78
II	Landrace	69,56	76,89	20,91	1,34
III	Estonian bacon	69,35	76,90	20,50	1,50
IV	Moldavian type of meat	71,20	76,41	21,30	1,52
60 kg					
I	Large White	63,20	74,93	21,77	2,80
II	Landrace	68,81	74,23	21,69	1,83
III	Estonian bacon	67,13	75,40	22,04	1,91
IV	Moldavian type of meat	71,00	74,37	22,51	2,467
100 kg					
I	Large White	56,00	74,23	21,69	2,82
II	Landrace	61,93	72,12	22,53	4,14
III	Estonian bacon	60,21	71,96	22,35	4,26
IV	Moldavian type of meat	63,80	71,05	23,20	4,63
120 kg					
I	Large White	52,20	73,27	22,50	3,70
II	Landrace	58,05	72,99	23,25	3,32
III	Estonian bacon	56,84	72,85	23,09	3,15
IV	Moldavian type of meat	59,08	71,63	23,56	4,16

If we analyze this context and the modification of protein quantity, we can notice that it will grow on every breed, but most significant on Moldavian type of meat with over 1%.

Fat percentage on meat, together with the age increases on almost every breed, but also we may notice that regardless the age, a bigger quantity of thickness in meat is signaled on Large White breed, but concerning meat breeds such as Estonian bacon, there was identified a smaller percentage of thickness on swine of 60 kg. Fat content is stabilized and great differences were not signaled.

One of main indexes of technological quality meat appreciation is the capacity of retaining water. "Free" water in meat has a strong influence on meat products quality. (tab. 3).

Chemical composition of the gathered fat influences the quality of salami, which can not be prepared without pork fat. This confirms that the study of nutritional elements presents an interest not only for the consumer but also for the processor, which is not indifferent on bacon quality used in technological processes (tab. 2).

Table 2 The content of nutritional elements in meat, based on breed and body weight of swine, %

Lot	Nutritional elements, %	Weight category, kg							
		% of thickness in carcasses	20	60	% of thickness in carcasses	100	% of thickness in carcasses	120	% of thickness in carcasses
I	water	13,40	18,12	9,11	19,58	5,63	2,43	33,48	4,17
	proteins		4,22	3,45		2,43	2,20		
	thickness		77,45	87,33		91,89	93,63		
II	water	12,23	15,63	10,17	13,35	5,87	2,61	24,87	4,03
	proteins		5,82	3,12		2,61	2,04		
	thickness		78,4	86,23		91,42	93,77		
III	water	12,60	15,05	10,04	16,50	5,79	1,59	26,50	4,40
	proteins		5,62	4,16		1,59	1,98		
	thickness		74,90	86,71		91,45	93,10		
IV	water	11,90	16,72	9,77	14,75	5,73	2,71	23,42	4,48
	proteins		5,03	4,81		2,71	2,30		
	thickness		78,12	83,86		91,48	93,16		

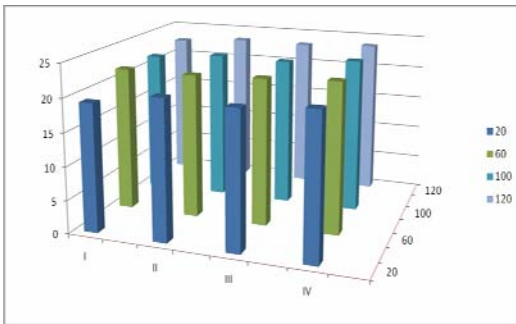


Fig. 1. The evolution of protein content in meat according to breed and body mass

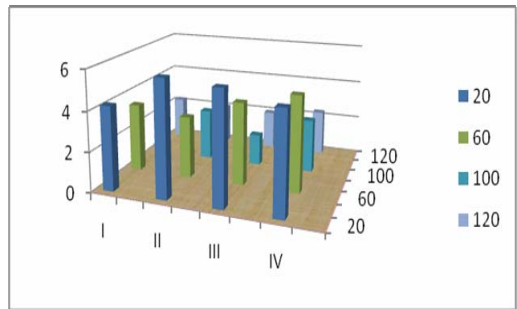


Fig. 2 Protein content in fat according to breed and body mass

Table 3 Breed influence and body weight of swine on retaining water capacity and meat acidity

Lot	Breed	Weight category, kg			
		20	60	100	120
Water retention capacity, %					
I	Large White	53,87	56,30	56,55	57,64
II	Landrace	53,35	54,12	54,51	55,30
III	Estonian bacon	53,24	53,56	53,60	54,65
IV	Moldavian type of meat	53,70	55,37	55,36	56,28
Acidity (pH)					
I	Large White	6,10	6,06	6,03	5,80
II	Landrace	5,83	5,55	5,24	5,23
III	Estonian bacon	5,81	5,63	5,18	5,19
IV	Moldavian type of meat	5,61	5,70	5,48	5,27

Chemical composition of meat, represented in table 2 reveals that water and protein quantity decreases together with age and body weight increase of young swine, while the fat proportion is increasing with 15-16% at every meat breed. However, there were noticed great differences in carcasses in the period from 20 until 120 kg. Bacon

quantity was increased with 24,12% and at Moldavian type of meat with 15.66%, the difference being of 8,46%.

The capacity of retaining water grows, together with the increase of body mass in every experimented lot, from 53% at 20 kg until 54-57% at 120 kg.

We must mention that the capacity of retaining water determined in meat, at 20 kg, did not vary between breeds while at 120 kg a bigger value of 54,64% was noticed at Large White breed and 56,28% at Moldavian type of meat, differences between this breeds being of 1,2-3%.

Meat color, capacity of retaining water, freshness and other are influenced by meat PH, an indicator which has a genetic support of 40% [2].

The results concerning meat acidity on genotype functions and body mass, proves

that meat PH, together with swine growth is decreasing, and at 120 kg the acidity of meat on Large White breed, is kept under normal limits.

On meat breeds, this can be noticed at basic weight, after that PH is decreasing but does not pass beyond the admissible limits, for a qualitative meat.

In table 4 there are represented the results of chemical composition study and physical properties of meat, obtained at different swine hybrids.

Table 4 Chemical composition and physical properties of meat at swine hybrids (Long rear muscle)

Breed combination and types	Chemical composition, %			pH	Capacity of retaining water, %
	Water	Protein	Fat		
Large White x Landrace	71,71	22,05	5,03	5,58	43,9
Large White x Hampshire	71,05	22,37	5,33	5,59	43,8
"Southern " type of meat x Hampshire x Yorkshire	70,54	23,51	5,02	5,62	43,3
Southern type of meat x Hampshire x Landrace	80,39	23,42	5,28	5,05	42,8

After water content which was equal with 79-71%, significant differences between hybrids were not registered. Protein quantity was 22-23%, being in a continuous growth at three racial hybrids. Fat percentage in long rear muscle at young swine varied between the limits of 5.02-5.33 %, and meat acidity (pH) at different hybrids was equal with 5.58-5.65%, an indicator which confirms the good quality of meat, concerning its physical-chemical and technological properties.

## CONCLUSIONS

1. Muscular tissue on swine, no matter the genotype, at first months of life contain a bigger quantity of water and a smaller of proteins and fat, comparatively with adult life. Together with the body mass growth, water content in meat is reduced, and the fat quantity increases.

2. At first months after birth, protein quantity in meat on young swine increases, then the percentage of protein is stabilized and the body mass growth does not influence significantly the protein quantity. Important differences between breeds were not signaled,

but we must mention some growth tendencies on protein quantity, at different types of meat.

3. The capacity of retaining water at studied genotypes grows together with body mass growth, but the acidity is decreased. Water content in bacon, together with body mass increase, drops, while fat quantity increases.

4. Swine hybrid resulted from combining Large White, Landrace, Hampshire, Southern type of meat, Yorkshire breeds – have produced meat with high protein content, sufficient inter muscular fat quantity, for the assurance of freshness and juiciness but also a pH equal with 5.58-5.65.

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