

**THE EFFECT OF MIXED FODDERS ON THE GROWTH,
CARCASS COMPOSITION AND MEAT QUALITY IN PIGS**

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Abstract

The aim of our study was to evaluate the effect of mixed fodders with a high content of corn or barley on the productive characteristics of growing pigs. The pigs (20 animals) were separated into two groups (10 animals each). The pigs in the first experimental group were fed a mixture based on corn meal; the pigs in the second group were fed a diet, with a high content of barley. The live weight of the pigs which were fed a barley diet, was slightly higher during the first growing phase – the difference came to 1.17 kg ($p < 0.05$), but at the end of the experiment no significant differences in the average daily weight gain were observed in both groups: 0.500 and 0.501 g. Differences were found in the total fodder consumption, which amounted to 2.10 kg a day in the first group, and to 1.96 kg per day in the second group. The food consumption per 1 kg LW was of 4.21 and 3.91, respectively. No differences were found in carcass characteristics regarding slaughter weight, but the thickness of back fat in the pigs, which were fed diets based on barley, was of 10.33 mm, which was lower by 6.33 mm compared to the pigs in the first group. No differences in chemical composition and meat quality were detected among the pigs in the experimental groups except for the colour intensity of the meat from the pigs in the second group, which was brighter by 59 units ($p < 0.001$).

Key words: growing pigs, growth performance, blood parameters, meat and carcass quality

INTRODUCTION

Pigs have high fecundity, high feed conversion efficiency and mature early, with a short generation interval. They are raised under a variety of production systems ranging from simple family farms or large-scale integrated pig industries with sophisticated biosafety measures (Machebe et al., 2009).

Feed and fodder play a central role in providing proper nutrition to livestock. The development of pork production is determined by the level of the forage reserve intensification. An increase of 93-95% in the number of pigs on farms is achieved using complete feed. The major components of swine rations are cereal grains such as barley, corn, and oats, which contain 10-12% protein, 40-70% starch and have, traditionally, supplied energy (Iowa State University Extension, 2008). Developed regions are still major users of cereals, oilseeds and meals, with over 60% of global consumption of each, while developing regions make proportionally greater use of brans and roots and tubers. Brans are particularly important in Asian regions, where rice bran is a major feed resource (EEAP, 2006). In turn, the extent of this biomass availability and potential use will determine an approximation of carrying capacity, animal productivity and potential improvements (Devendra and Leng, 2011).

Scientific options are available to implement the concept of 'sustainable animal diets' being developed at FAO which consider the suggestion of reducing grains and other food materials in diets of

monogastric animals as they compete with human food (Makkar, 2012). FAO's in-depth study in this area has revealed some novel co-products that could be used as livestock feed (FAO, 2012).

In some countries in northern Europe and in the Western part of Canada barley is the major feed grain. Barley may replace all the corn in the diets fed to weanling pigs and to gestating sows. The results of recent research indicate that in diets fed to growing-finishing pigs, barley can only be used up to 60% of the total ration use of small grains in pig production (Hans, 2011). The animal body digests up to 80-90% of barley (McCartney and Vaage 1994; Abbeddou et al., 2011) and the concentration of digestible amino acids and digestible phosphorus in it is greater than in corn (Hans, 2011). Barley grain is the best fodder for pigs; its addition to the diets for pigs has an immediate effect on the pork quality.

Traditionally, corn has been the mainstay correct amount of lysine, then generally the levels of the most swine feeding programs (Myer et al., 1999). Prache et al. (2003) and Carr et al. (2005) established that pigs fed corn-based diets could produce inferior quality products compared with pigs fed barley- or wheat-based diets in terms of meat and fat color, because yellow corn contains higher amounts of carotenoids, naturally occurring fat soluble pigments often found in plants. According to Robertson et al. (1999) pigs fed corn-based diets had darker LM compared with those fed diets based on barley. Thus, the effects of feeding corn vs. barley to swine on growth performance and carcass characteristics have not been conclusively determined (Opapeju et al., 2006).

To increase the feeding efficiency it is necessary to improve not only the mixed fodders formulation (Polishchuk, 1996) but also the system of swine nutrition (Aitova et al., 2000). Pig farming should aim at the realization of the genetic potential and at the increase of body resistance and productivity (Medvedsky, 1998, Negrozova, 2000). At the same time, it is important to consider not only the pig's age and body weight, but also the raising purpose (for meat or reproduction), as well as breed or hybrid.

Nowadays high-fat meat has lost its position on the market. Furthermore, the use of such meat in human nutrition is limited by its negative impact on health, because it is in conflict with the concept of a rational and balanced diet. According to Ikani and Dafwang (1995), pigs surpass other red meat animals in converting feed to flesh. Numerous comparative studies on the effect of different feed rations on the quality of pork showed the benefits of feeding using high-energy diets with low protein content in order to improve the meat nutritional value. The researches (Robertson W.M. et. al., 1999) also showed, that the pork from the pigs fed a diet based on barley, is tenderer than the pork from the pigs fed a fodder consisting of a mixture of corn or barley and triticale.

In this regard, our task was to study the effect of different mixed fodders with a high content of corn or barley on the productive indicators and the quality of pork.

MATERIALS AND RESEARCH METHODS

The aim of the research was to test the recipes of mixed fodder and to optimize the feeding of the pig hybrids raised for meat production. The working methodology was focused on the assessment of the influence of mixed fodders with different levels of feed components on growth performance, carcass characteristics, and meat quality in growing-finishing pigs fed diets based on corn and barley. The research was conducted in the period from 25.05 to 05.11.2012. It consisted of a preliminary period and an experimental period; the latter was divided into three periods: the first – growing period, the second – growing-finishing period, and the third – finishing period.

To assess the growth and the carcass performance in the pigs in the experimental groups, female pigs were used, in order to eliminate the influence of the sex factor. Twenty pigs of Landrace x Pietrain hybrids were used as biological material. The tested animals were randomized (Ovseanico, 1976) into two homogeneous groups: G_A and G_B . The pigs in the first experimental (G_A) group were fed a mixture

based on corn meal; the pigs in the second group (G_B) were fed a diet, with a high content of barley. To establish the influence of fodders quality on the quantitative and qualitative performance of pigs during the growing-finishing phases, the effect of two types of mixed fodders characterized by a higher content of corn and barley was studied. The recipes of mixed fodder were developed taking into account the availability and variability of fodder ingredients, the optimal nutritional and economical variants in line with the nutritional requirements that had been adapted to the physiological state and the age of the animals (Soft-ware "HYBRIMIN"; Kalashnikov et al., 2003). The animals were fed at discretion giving them constant access to water; they were kept in the same pig house under the same environmental conditions and fed identically. The fodder consumption was recorded daily.

During the biological test, the following indices were studied: the evolution of body weight per period, the average daily gain per period, the average daily fodder consumption, and the specific fodder consumption. Each pig was weighed at the beginning of the trial, at the end of each experimental phase, and at the end of the trial. The calculations of the average daily gain and the specific fodder consumption per 1 kg of weight increase were made using standard techniques. During the first research phase the nutritional value of indigenous fodders was assessed (Petuhcova et al., 1989).

To determine the effect of nutrients and other products on the swine metabolism, and to justify the production results the following indices were determined: plasma proteins (total protein, albumin, globulin, etc.); hematological profile; mineral profile (calcium, phosphorus). Blood samples were collected using anticoagulant at the beginning and the end of the trial, and tested at the Republican Diagnostic Centre.

At the end of the trial, the carcass quality was analyzed. After the slaughter the layer of fat, the eye muscle area and other indices were determined (Cucu et al., 2004, Antipova et al., 2001).

Statistical analysis of the trial data and the testing of the difference significance were done using conventional methods (Plohinski, 1969).

RESULTS AND DISCUSSION

Chemical composition and nutritive value of the fodders used in the trial

The biological testing of the structure of the mixed fodder recipes based on indigenous raw materials for and specific to the pig hybrids by age category was carried out at the State Enterprise for Pig Selection and Hybridization "Moldsuinhibrid".

The chemical composition of fodder ingredients depends on many factors. That is why, at the beginning of the trial a number of chemical analyzes of the indigenous raw materials were performed in the laboratory of the Department of General Animal Husbandry of the SAUM. The analysis of the gross chemical composition of the forages indicated a difference in the total moisture and dry matter content, which varied in all examined samples. The chemical analysis of grains, the products resulting from their processing and extrusion showed that there were differences in nutrient content compared with literature data (Tables 1, 2).

Table 1. The content of DM in fodders in natural state, %

Fodders	¹⁾ Enterprise „Moldsuinhibrid”			²⁾ Kalashnikov,2003		Difference between 1) and 2)
	initial moisture	hygroscopic moisture	total moisture	¹⁾ DM	²⁾ DM	
Corn	6,49	7,29	13,78	86,22	85,00	1,22
Barley	8,81	5,20	13,55	86,45	85,00	1,45
Wheat	6,48	6,97	13,45	86,55	85,00	1,35
Peas	5,64	7,29	12,93	87,07	85,00	2,07
Wheat bran	8,70	6,92	15,62	84,38	85,00	-0,62
Fishmeal	5,11	5,46	10,57	89,43	90,00	-0,57
Extruded corn	2,74	6,78	9,52	90,48	-	-
Extruded pea	2,65	6,73	9,38	90,62	-	-
Extruded wheat	4,79	6,65	11,44	88,56	-	-
Extruded barley	3,48	6,76	10,24	89,76	-	-

Table 2. The chemical composition of fodders in their natural state, g / kg

Fodders	¹⁾ Enterprise „Moldsuinhibrid”			²⁾ Kalashnikov, 2003			Difference between ¹⁾ and ²⁾		
	CP	Crude fat	Crude fibre	CP	Crude fat	Crude fibre	CP	Crude fat	Crude fibre
Corn	65,74	25,25	23,85	103,00	42,00	38,00	-37,26	-16,75	-14,15
Barley	123,14	42,80	80,10	113,00	22,00	49,00	10,14	20,80	31,10
Wheat	127,19	11,78	31,98	133,00	20,00	17,00	-5,81	-8,22	14,98
Peas	215,14	8,68	80,77	218,00	19,00	54,00	-2,86	-10,32	26,77
Wheat bran	130,74	26,02	74,77	151,00	41,00	88,00	-20,26	-14,98	-13,23
Fishmeal	591,16	98,69	80,75	535,00	108,00	-	56,16	-9,31	-
Extruded corn	70,03	6,61	69,05				-		
Extruded pea	195,67	7,69	31,93				-		
Extruded wheat	138,05	8,66	28,09				-		
Extruded barley	105,21	9,56	81,95				-		

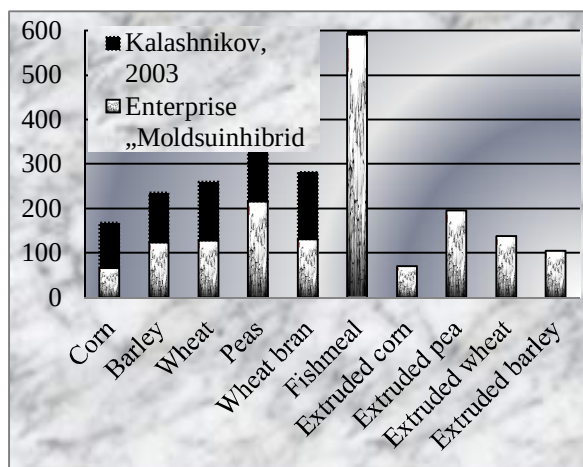


Fig. 1. Crude protein content in fodders. g

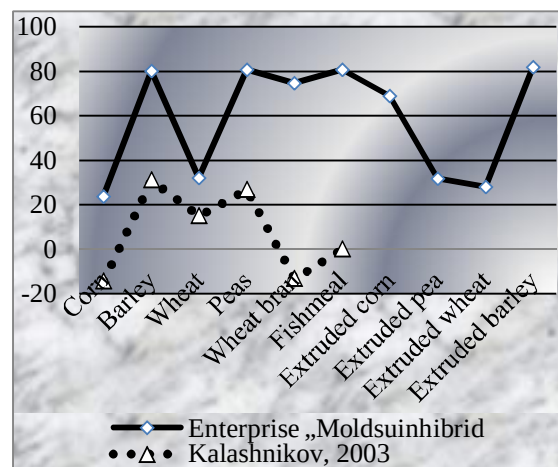


Fig. 2. Crude fat content in fodders. g

The variations of CP content, according to the results of the chemical analysis compared with the specialty literature data, were as follows: in corn grains – 37.2 g, in barley grains + 10.14 g, in wheat grains – 5.81 g, in wheat bran – 20.26 g (Figure 1).

The data on the crude fat obtained after a chemical analysis showed, that its content was lower in all fodders (except the wheat grains) (Figure 2) compared with the indices in specialty literature.

The difference in crude fibre content in forages, according to laboratory data in comparison with the specialty literature data, was as follows: in corn grains -14.15 g, in barley grain +31.10 g, in wheat grains +14.98 g, in peas +26.00 g, and in wheat bran -3.23 g (Figure 3).

The nutritional value of indigenous fodders used in the rations for pigs was determined based on the

chemical composition of fodders (determined through analyses) and the digestibility coefficients taken from literature (Table 3). It was also established, that the overall nutritional value in ONU of the samples of all fodders taken from the enterprise "Moldsuinhibrid", was lower in comparison with the data in the specialty literature, except for the peas the overall nutritional value of which was virtually the same.

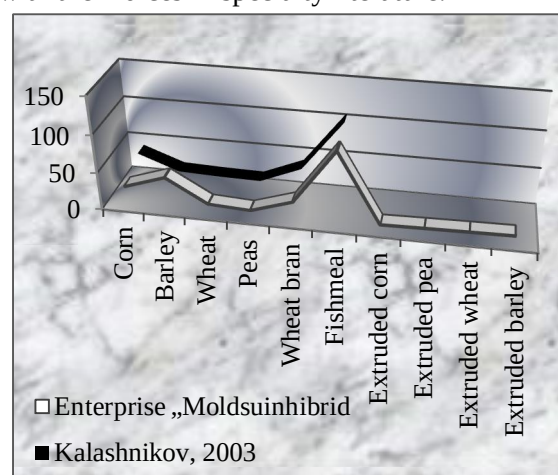


Fig. 3. Crude fiber content in fodders, g

Table 3. Nutritional value in ONU (oats nutrition units)

Fodders	¹⁾ Enterprise „Moldsuinhibrid”	²⁾ Kalashnikov, 2003	Difference between ¹⁾ and ²
Corn	1,27	1,33	-0,06
Barley grains	1,10	1,15	-0,05
Wheat grain	1,19	1,28	-0,09
Pea grain	1,23	1,18	0,05
Wheat bran	0,74	0,75	-0,01
Fishmeal	1,17	1,31	-0,14
Extruded corn	1,28	-	-
Extruded pea	1,32	-	-
Extruded wheat	1,21	-	-
Extruded barley	1,24	-	-

The analysis of the results on the fodders nutritional energy did not show significant differences compared with the data in specialty literature, except for the pea beans the value of which, in the samples taken at the enterprise, was higher, the difference being of 7.95 MJ (Table 4).

Table 4. The nutritional value of fodders in ME, MJ

Fodders	¹⁾ Enterprise „Moldsuinhibrid”	²⁾ Kalashnikov, 2003	Difference between ¹⁾ and ²
Maize	13,29	13,67	-0,38
Barley grains	12,60	12,70	-0,10
Wheat grain	13,13	13,56	-0,43
Pea grain	21,01	13,06	7,95
Wheat bran	10,19	9,28	0,91
Fishmeal	14,23	15,07	-0,84
Extruded corn	13,28	-	-
Extruded pea	14,75	-	-
Extruded wheat	13,37	-	-
Extruded barley	13,26	-	-

The keeping and feeding of the experimental pigs

The testing of mixed fodders for pigs was carried during different periods (Tables 5, 6).

Table 5. The structure of mixed fodders

Ingredients, %	Experimental periods			
	growing period		growing-finishing and finishing	
	G _A	G _B	G _A	G _A
Corn	39,0	10,0	35,0	10,0
Barley	8,0	43,0	11,4	43,0
Wheat	10,0	11,5	15,0	11,0
Wheat bran	6,0	6,0	11,10	8,0
Extruded peas	9,5	8,0	8,5	8,5
Soybean meal	6,0	5,0	9,0	9,0
Sunflower meal	11,0	6,0	-	-
Fishmeal	5,0	5,0	5,0	5,0
Premix	2,5	2,5	2,5	2,5
Salt	0,5	0,5	0,5	0,5
Chalk	0,5	0,5	0,5	0,5
Soybean oil	2	2,0	1,5	2,0

Table 6. Quality of the mixed fodders

Specification	Experimental periods			
	growing period		growing-finishing and finishing	
	G _A	G _B	G _A	G _B
DM , %	85.26	85.25	84.97	85.24
ME, Mj	13.19	12.70	13.07	12.79
Crude Protein , %	15.16	15.01	15.00	15.46
Crude fiber, %	5.93	5.80	4.20	4.95
Crude fat, %	8.26	6.44	5.76	5.65
Lysine, %	0.85	0.80	0.77	0.83
Methionine + cystine, %	0.31	0.32	0.34	0.36
Threonine, %	0.35	0.34	0.33	0.35
Sodium, %	0.12	0.12	0.16	0.16
Calcium, %	0.75	0.76	0.74	0.75
Phosphorus, %	0.60	0.62	0.57	0.60

The experimental animals were kept in similar conditions in special boxes, and fed in the same way three times a day.

The dynamics of the pigs' live weight in the trial

The dynamics of the animal body weight change during the research was monitored by weighing each

Group	Indices	The ADG/ period of growth, kg		
		the growing	growing-finishing	on the whole trial
G _A	M± m	0,385±0,021	0,571±0,020	0,500±0,010
	σ ± m _σ	0,067±0,026	0,063±0,014	0,032±0,007
	Cv ± m _{cv}	17,373±3,885	11,101±2,482	0,032±1,438
G _B	M± m	0,409±0,026	0,559±0,017	0,501±0,012
	σ ± m _σ	0,083±0,019	0,055±0,012	0,039±0,009
	Cv ± m _{cv}	20,305±4,540	9,775±2,186	7,767±1,737

Table 7. The dynamics of the pigs' BW during the trial, kg

pig at the beginning of the preparatory period, during the experimental period and the end of the trial.

At the beginning of the experimental period the average weight of the gilts in all experimental groups was practically the same, the data being statistically non-authentic. It was determined that the pigs' average BW at the beginning of the preparatory period ranged from 17.85 to 18.05 kg, and at the beginning of the actual trial it ranged from 18.50 to 18.85 kg (Table 7).

The dynamics of BW showed that in all age periods the growth intensity in young swine was high in both groups. Accordingly, at the age of 4 months, the growing-finishing period, the difference between the pigs in the groups G_A and G_B was of 1.17 kg ($p < 0.05$). At the end of the trial, no differences were observed in weight gain between the group G_A (94.27 kg) and G_B (94.33). The results obtained showed that was not influenced difference by the composition of the mixed fodder. Similar results were obtained by Robertson et al. (1999) in the experiments on young pigs.

The data analysis on the evolution of the ADG obtained during different periods of growth of the young pigs in the experimental groups showed no differences on average during the trial: in the G_A the ADG was 500g, and in the G_B – 0.501 g (Table 8).

Morphological and biochemical blood parameters in the experimental pigs

At the beginning of the trial blood samples were taken from three animals in each group to determine some morphological and biochemical parameters. Blood samples were collected from sows 60 and 210 days old and analyzed at the Republican Centre of Medical Diagnosis. The investigations were conducted on six animals.

In terms of immunity assessing, tests were performed regarding the leukocyte formula, and the total leukocyte and eosinophils were counted. The biochemical parameters in the animals' blood were measured in order to assess the aspartate aminotransferase, alanine aminotransferase, the total protein, albumin, globulin, etc. The morphological and biochemical indicators in the blood samples met the physiological norm; that is there were not significant differences (Tables 9-12).

Table 8. Evolution of the ADG of the pigs, kg

Group	Indices	At the end of the period		
		growing	growing-finishing	finishing
G _A	M± m	29,50±0,408	41,18±1,284	94,27±1,530
	σ ± m _σ	1,291±0,289	4,059±0,908	4,838±1,082
	Cv ± m _{cv}	4,376±0,978	9,857±2,204	5,132±1,147
G _B	M± m	29,75±0,588	42,35±1,571	94,33±1,957
	σ ± m _σ	1,859±0,416	4,969±1,111	6,188±1,384
	Cv ± m _{cv}	6,248±1,397	11,733±2,624	6,560±1,467

Table 9. Morphological blood parameters at the beginning of the trial, (M ± m)

Indices		Group	
		G _A	G _B
Erythrocytes	10 ¹² /l	6.833±0.318	7.533±0.167
Hemoglobin	g/l	113.000±4.583	120.333±0.882
Color index	U	0.497±0.003	0.483±0.009
Platelets	10 ⁹ /l	504.000±	569.000±
WBC	10 ⁹ /l	25.600±5.781	27.067±0.939
Non-segmented leukocytes	10 ⁹ /l	3.667±1.453	3.000±0.577
Segmented leukocytes	10 ⁹ /l	37.000±2.517	37.000±2.082
Eosinophils	10 ⁹ /l	4.000±1.000	2.009±1.000
Lymphocytes	10 ⁹ /l	52.000±3.055	56.667±2.906
Monocytes	10 ⁹ /l	3.333±1.453	3.333±1.453

Table 10. Biochemical blood parameters at the beginning of the trial, ($M \pm m$)

Indices		Group	
		G _A	G _B
Total protein	g/l	52.510±4.815	48.580±3.239
Aspartate aminotransferase	U/l	133.333±18.342	131.667±32.769
Alanine aminotransferase	U/l	59.333±3.844	60.333±6.360
Alkaline phosphatase	U/l	356.667±89.678	384.333±94.510
Calcium	mmol/l	3.410±0.272	3.143±0.298
Phosphorus	mmol/l	5.297±0.144	3.823±0.217
Albumin/Globulin Ratio	g/dl	0.583±0.050	0.540±0.076
Albumin	U/l	29.870±2.263	29.287±2.829
Albumin	%	36.700±1.930	34.800±3.121
α_1 -globulin	%	8.733±3.968	10.100±4.245
α_2 - globulin	%	30.133±2.321	31.633±2.842
β_1 - globulin	%	14.000±2.879	12.367±2.095
γ - globulin	%	10.433±1.994	11.100±0.833

Table 11. Morphological blood parameters at the end of the trial, ($M \pm m$)

Indices		Group	
		G _A	G _B
Erythrocytes	10 ¹² /l	7.567±0.088	7.800±0.100
Hemoglobin	g/l	122.667±1.333	129.333±1.453
Color index	U	0.487±0.009	0.497±0.009
Erythrocyte sedimentation rate	mm/ora	3.333±0.882	3.333±0.333
Non-segmented leukocytes	10 ⁹ /l	25.200±0.651	21.133±2.085
Segmented leukocytes	10 ⁹ /l	25.667±2.906	22.333±4.410
Eosinophils	10 ⁹ /l	3.000±1.000	3.000±1.000
Lymphocytes	10 ⁹ /l	71.333±3.180	58.333±6.766
Monocytes	10 ⁹ /l	1.000±0.000	1.500±0.500

Table 12. Biochemical blood parameters at the end of the trial, (M ± m)

Indices		Group	
		G _A	G _B
Total protein	g/l	68.790±1.910	68.947±1.133
Aspartate aminotransferase	U/l	50.000±8.963	57.000±7.234
Alanine aminotransferase	U/l	54.333±1.202	71.000±1.000
Alkaline phosphatase	U/l	224.000±21.385	220.000±58.506
Calcium	mmol/l	2.863±0.296	3.040±0.099
Phosphorus	U/l	2.980±0.214	6.080±1.045
Albumin/Globulin Ratio	g/l	0.547±0.024	0.623±0.019
Albumin	g/l	32.937±0.677	33.633±0.412
Albumin	%	35.300±1.069	38.333±0.657
α ₁ -globulin	%	2.100±0.208	2.500±0.265
α ₂ - globulin	%	23.300±0.850	22.367±1.576
β ₁ - globulin	%	19.267±1.105	17.467±0.481
β ₂ - globulin	%	11.750±0.150	10.533±1.691
γ- globulin	%	8.467±0.623	8.800±0.709

The influence of mixed fodder on the quality of the carcasses of swine hybrids

In order to assess, in accordance with the rules and test methods specified in the national standards, the quality of the pig carcasses and meat [Cucu et al., 2004], three pigs from each group were slaughtered. After that, the weight of the carcasses and the internal organs were determined, and the qualitative parameters of the carcasses, the fat thickness, the eye muscle area, etc. were assessed. The slaughter yield after the utilization of different mixed fodder recipes, in which corn and barley at different levels were added, was insignificant (Table 13). A tendency of fat decrease measured at the point "b" in the pigs in the group G_B was observed – it was of 10.33% in comparison with the group G_A in which it was of 16,67%, i.e. by 6.34 % less.

Table 13. Quality parameters of the pig carcasses, kg, ($M \pm m$)

Specification (fig. 4)	Group	
	G _A	G _B
BW	96,33±0,882	96,33±1,333
HCW	91,57±2,199	90,67±0,882
Weight after slaughter	78,02±1,005	78,50±1,127
Right half-carcasses' weight	34,45±0,454	35,28±1,059
Slaughter yield (%)	81,34±0,201	81,49±0,086
Head mass	7,38±0,311	7,55±,0104
Epiglottis mass	0,18±0,017	0,28±0,060
Lung mass	1,20±0,115	1,38±0,060
Fat mass, kg	0,25±0,029	0,23±0,033
Stomach content weight	3,02±0,130	2,87±0,186
Bowel mass	8,87±0,159	8,85±0,597
Heart mass	0,37±0,017	0,43±0,017
Liver mass	1,83±0,088	2,03±0,309
Kidney weight	0,23±0,060	0,40±0,029
Spleen weight	0,14±0,021	0,13±0,033
Reproductive organs weight	0,37±0,044	0,37±0,044

Table 14. The main measurements of the pig carcasses, cm, ($M \pm m$)

Specification (fig. 4)	Group	
	G _A	G _B
Great length (1)	96,667±1,202	95,667±1,333
Short length (2)	80,000±1,555	79,000±0,577
Length of the ham (3)	58,000±0,577	57,667±0,333
Small length of the ham (4)	29,000±0,577	27,667±0,667
Chest depth A A ¹ (chest depth)	36,667±0,667	37,667±0,333
Cavity depth of the thorax	24,667±0,882	24,000±0,577

Table 15. The fat layer of the pigs' carcass, mm ($M \pm m$)

Specification (fig. 4)	G _A	G _B
a	23,667±0,882	21,333±0,667
b	16,667±0,333	10,333±0,333
d	8,333±0,333	9,333±0,333
f	16,833±0,441	18,333±0,882
h	15,667±0,333	15,000±0,577
q	13,667±0,333	13,000±0,577

a, b, d, f, g, h - the points where the fat thickness is measured,(fig. 4)

The eye muscle area did not show a significant difference in the lots G_A (36.64 mm²) and G_B (36.68 mm²).

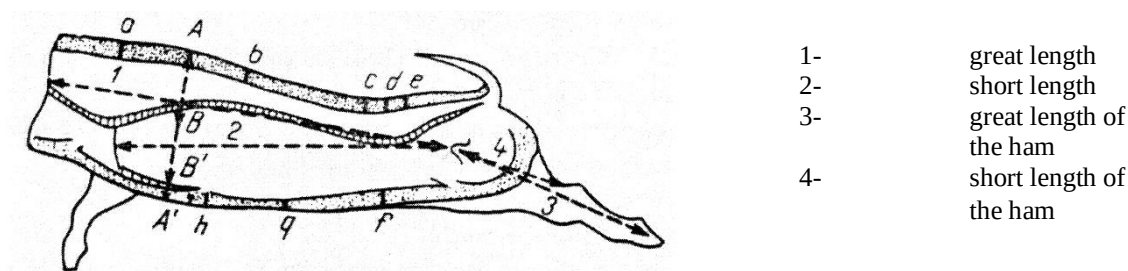


Fig. 4. The main measurements of the pig carcasses:

The technological characteristics and the chemical composition of meat

The following indices were determined for the muscle "*Longissimus dorsi*": dry matter, moisture, crude protein, crude fat and crude ash, and the technological indices of meat (meat color, retention capacity and binding capacity) (Table 16).

Table 16. Chemical composition and technological characteristics of meat, %, (M ± m)

Specification	Group	
	G _A	G _B
Moisture	73,37±0,106	73,60±0,104
Dry matter	26,63±0,106	26,40±0,104
Crude protein	22,02±0,041	23,27±0,275**
Crude fat	3,50±0,042	2,14±0,020***
Crude ash	1,12±0,003	1,00±0,132
Moisture retention capacity	66,26±0,921	71,44±1,029**
Moisture binding capacity	7,10±0,963	2,16±1,100**
Meat color intensity, UN	153±3,055	212±0,577***

t-student - * $p < 0.10$; ** $p < 0.01$; *** $p < 0.001$

The chemical composition of meat (LM) showed to be similar in both experimental groups. The quantity of crude protein in the muscle decreased in the samples taken in the group G_A (22.02%) in comparison with (23.27%) in G_B by 1.25%; a decrease of fat content was observed in the meat samples taken in the group G_B – by 1.36% compared to G_A.

The capacity of moisture retention lowered in the experimental group G_A (66.26%), which was by 5.18% less than in G_B (71.44%), in which the pigs were fed a mixed fodder based on barley. On the other hand, the water-binding capacity was higher in G_A – by 4.94% compared to G_B. The highest intensity of meat colour (212 UN) was observed in the samples taken from the slaughtered animals from the group G_B which were fed a mixed fodder in which the amount of barley was 43%. The researchers showed that the technological indices and chemical composition of the meat were much influenced by the mixed fodder recipes used in feeding.

Feed consumption

During the experimental periods, the average daily feed intake and the specific consumption were calculated. Throughout the experimental period, the ADFI was lower in G_B, in which a ration based on barley was used, by 217.21 kg or 6.83%, respectively in comparison with G_A (Table 17).

It was also observed, that the ADFI was lower in the G_B –1.96 kg, in comparison with 2.10 kg in G_A, in which a ration based on corn at the level of 39% was used. The G: F in the group G_B was of 3.91 kg, and in the G_A it was higher by 0.30 kg compared to G_B.

Table 17. Average feed intake, kg

Periods	Group	
	G _A	G _B
growing	318,150	309,994
growing-finishing	482,000	478,222
finishing	2378,278	2173,000
total:	3178,428	2961,217
kg/pig	2,10	1,96
%	100,00	93,33
G:F	4,21	3,91

CONCLUSIONS

- The biological testing of the compound fodder recipes based on indigenous raw materials with the addition of corn grain at the level of 39% and barley grain at the level of 43% which were used in feeding young swine by age groups showed, that the pigs' growth rate depended on their genetic type.
- An ADG of 0.500 to 0.541 kg was obtained in the hybrids LXP, and the fodders consumption averaged to 2.10 kg in G_A and 1.96 kg in G_B.
- There were no significant differences in the quality of the carcasses in the experimental groups, thus indicating that they were not influenced by the formulas of the mixed fodder recipes.
- The diet regime based on corn in the group G_A compared with the barley-based diet in the group G_B did not affect the organoleptic or technological qualities of meat, but only the chemical indices, i.e. it caused an increase in fat levels.
- During the experimental period, the group of animals fed the mixture fodder containing greater proportion of barley realized better feed conversion ratio by 7,13% in comparison with the pigs fed a diet containing a greater proportion of corn.

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