

## FATTENING AND MEAT QUALITIES OF YOUNG PIGS OF DIFFERENT INTRABREED DIFFERENTIATIONS BY ORIGIN AND BREEDING VALUE

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### Abstract

*The paper presents the results of the study on fattening and meat qualities of young pigs of different intrabreed differentiation by origin and breeding value. The research was conducted on farms and processing enterprises of Dnipropetrovsk region, as well as in the Laboratory of Animal Husbandry of the State Institution "Institute of Grain Crops of NAAS of Ukraine". It was established that Large White young pigs from the controlled population at the age of achievement of live weight in 100 kg, at the fatback thickness at the level of 6-7 thoracic vertebrae and at the length of the chilled carcass exceed the minimum requirements of the elite class by 13.85% in average. Significant differences between animals of English and Hungarian origin were established in the average daily gain of live weight (2.28%) and the age of achievement of live weight in 100 kg (3.58%). Young pigs from group I (intrabreed differentiation by selection index "II") and from group II (intrabreed differentiation by Sazer-Fredin index) exceeded peers from opposite groups in the average daily gain in live weight by 7.48-2.75%; in the age of achievement of live weight in 100 kg by 3.87-3.41%. The difference between the groups in the fatback thickness at the level of 6-7 thoracic vertebrae, in the length of the chilled carcass and in the length of the bacon side of the chilled carcass varied from 0.51 to 12.16%. The maximum increase in additional products was obtained from the sale of one head of Large White young pigs of English origin (+1.86%), animals from group I of intrabreed differentiation by selection index "II" (+3.39%) and animals from group II of intrabreed differentiation by index Sazer-Fredin (+2.11%). Based on the obtained data, it was established that the criterion for selection of highly productive animals is the value of the selection index "II" +0.181 - +3.205, Sazer-Fredin index -1.017 - -0.102.*

**Key words:** breed, correlation, economic efficiency, fattening and meat qualities, index, variability, young pigs.

### INTRODUCTION

It was established that the increase in pig productivity is due to such important factors as optimization of feeding and keeping of animals of different gender and age, effective use of modern gene pool and implementation of innovative technological solutions (Bankovska & Voloshchuk, 2015; Anikhovska, 2007; Voloshchuk et al., 2013; Likhach, 2015; Likhach & Likhach, 2020; Nechmilov, 2019; Khramkova, 2021; Likhach et al., 2018; Povod et al., 2021).

An important issue is to improve breeding work in the pig husbandry. It is based on a system for assessing the breeding value of breeding boars, sows and their offspring, as well as the selection of high-yielding livestock for further breeding. To assess the animals of these production groups the main provisions of the Instruction on pig determination (Instruction on pig determination..., 2003) are used, namely: "Scale for assessing young animals in live weight and body length", "Scale for assessing boars and sows in live weight and body length", "Scale for assessing young animals in

the age of 100 kg", "Scale for assessment of young animals in fat thickness", "Scale for assessing boars and sows in fattening and meat qualities of offspring" etc.

However, studies of native scientists show that the use of breeding boars and sows of foreign selection has improved the fattening and meat qualities of young pigs (Onishchenko, 2019; Krasnoshchok, 2020; Susol, 2014; Rybalko & Floka, 2014; Sheiko et al., 2013; Gryshyna & Krasnoshchok, 2018), and the consequence of this is not an objective assessment of animals according to this normative document. Therefore, it is important to find effective methods of assessing the breeding value of fattening and meat qualities of young pigs in the conditions of purebred breeding.

The aim of the work is to study the fattening and meat qualities of young pigs of different intrabreed differentiation by origin and breeding value; based on the obtained data, to determine the criteria for selection of highly productive animals taking into account these factors and calculate the economic efficiency of research results.

## MATERIALS AND METHODS

The research was conducted on farms and processing enterprises of Dnipropetrovsk region and the Laboratory of Animal Husbandry of the State Institution "Institute of Grain Crops of the National Academy of Agrarian Sciences of Ukraine".

Large White young pigs, obtained from sows of native selection and breeding boars of Azuro (Hungarian selection), C 61203 Taffitus and C 57801 Kotilo (English selection), were the object of the study.

Evaluation of young pigs in fattening and meat qualities was carried out taking into account the following indicators: average daily gain in live weight during control fattening, kg; age of achievement of live weight in 100 kg, days; fatback thickness at the level of 6-7 thoracic vertebrae, mm; length of chilled carcasses, cm (Berezovsky & Khatko, 2005).

The average daily gain in live weight (1) of young pigs and the age of achievement of live weight in 100 kg (2) were calculated by the following formulas:

$$X = \frac{T_2 - T_1}{A_2 - A_1} \times 1000 \quad (1)$$

where: X - average daily gain, g; T<sub>1</sub> - weight of animals at the beginning of the accounting period, kg; T<sub>2</sub> - weight of animals at the end of the accounting period, kg; A<sub>1</sub> - age of animals at the beginning of the accounting period, days; A<sub>2</sub> - age of animals at the end of the accounting period, days; 1000 - conversion factor in grams;

$$X = B + \frac{100 - m}{A} \quad (2)$$

where: X - age of achievement of live weight in 100 kg, days; B - the actual age of the animals on the day of the last weighing, days; m - the actual weight of animals on the day of the last weighing, kg; A - average daily gain of animals during the accounting period, kg (Berezovsky & Khatko, 2005).

Comprehensive evaluation of young pigs in fattening and meat qualities was performed according to the following mathematical models of selection indices:

$$\dot{E} = \frac{1}{(G_i \times \Delta_i)} - \frac{1}{(G_o \times \Delta_o)} \quad (3)$$

where: I - selection index, points; G<sub>n</sub> - quadratic average deviation of the index "average daily gain of live weight, g"; G<sub>m</sub> - quadratic average deviation of the index "fatback thickness at the level of 6-7 thoracic vertebrae, mm"; Δ<sub>n</sub> та Δ<sub>m</sub> - deviation of an individual trait from the average population value (Getia, 2009);

$$I = \frac{1}{\sigma_g} \times \Delta G_1 - \frac{1}{\sigma_f} \times \Delta F_1 \quad (4)$$

where: I - Sazer-Fredin index, ΔG<sub>1</sub> – growth rate in deviations from the mean value; ΔF<sub>1</sub> - fatback thickness in deviations from the mean value; σ<sub>g</sub> – phenotypic standard deviation of growth rate; σ<sub>f</sub> – phenotypic standard deviation of the fat thickness (Kozlovsky et al., 1982). Biometric processing of the obtained data (Kovalenko et al., 2010) and calculation of economic efficiency of research results (Method of definition of economic..., 1983) were carried out according to the generally accepted methods.

## RESULTS AND DISCUSSIONS

The research results show that young pigs in the controlled population are characterized by high rates of fattening and meat qualities. Thus, the average daily gain in live weight during the period of control fattening is  $780.4 \pm 5.91$  kg (Cv = 4.91%); the age of achievement of live weight in 100 kg is  $171.8 \pm 1.44$  days (Cv = 5.10%); fatback thickness the at the level of 6-7

thoracic vertebrae is  $22.3 \pm 0.41$  mm (Cv = 11.36%); the length of the chilled carcass -  $96.8 \pm 1.62$  cm (Cv = 4.10%); the length of the bacon side of the chilled carcass is  $82.6 \pm 5.03$  cm (Cv = 14.93%). The selection index "И" ranges from -3.561 to +3.205, the Sazer-Fredin index from -1.017 to +4.738 points, respectively. The results of studies of fattening and meat qualities of Large White young pigs of English and Hungarian origin are shown in Table 1.

Table 1. Fattening and meat qualities of Large White young pigs of English and Hungarian origin

Indexes, units of measurement	Biometric indexes	Group	
		I	II
Average daily gain in live weight during the period of control fattening, g	<i>n</i>	10	32
	$\bar{X} \pm S_x$	801.2±8.96	775.9±6.26
	$\sigma \pm X_\sigma$	38.89±8.700	37.59±4.698
	$Cv \pm Sc_v, \%$	4.85±1.085	4.84±0.605
Age of achievement of live weight in 100 kg, days	$\bar{X} \pm S_x$	173.5±1.37	178.3±0.83
	$\sigma \pm X_\sigma$	4.12±0.921	5.02±0.627
	$Cv \pm Sc_v, \%$	2.37±0.530	2.81±0.351
Fatback thickness at the level of 6-7 thoracic vertebrae, mm	$\bar{X} \pm S_x$	19.7±0.97	20.9±0.31
	$\sigma \pm X_\sigma$	2.91±0.651	1.91±0.238
	$Cv \pm Sc_v, \%$	14.77±3.304	9.13±1.141
Length of chilled carcass, cm	<i>n</i>	3	21
	$\bar{X} \pm S_x$	95.7±0.75	96.7±0.34
	$\sigma \pm X_\sigma$	1.50±0.641	1.67±0.257
	$Cv \pm Sc_v, \%$	1.56±0.639	1.72±0.265
Length of bacon side of chilled half-carcass, cm	$\bar{X} \pm S_x$	84.0±1.22	85.7±0.64
	$\sigma \pm X_\sigma$	2.44±1.000	3.08±0.475
	$Cv \pm Sc_v, \%$	2.90±1.188	3.59±0.554

It was found that young pigs from group I exceeded peers from group II in terms of average daily live weight gain during the period of control fattening by 25.3 g (td = 2.32; P<0.05); age of achievement of live weight in 100 kg by 4.8 days (td = 3.01; P <0.01); fatback thickness at the level of 6-7 thoracic vertebrae by 1.2 mm (td = 1.18; P> 0.05). The difference between the groups in the length of the chilled carcass is 1.0 cm (td = 1.21;

P>0.05), in the length of the bacon side of the chilled carcass is 1.7 cm (td = 1.24; P>0.05). Analysis of the results of control fattening of young pigs of different intrabreed differentiation according to the selection index "И" showed that animals from group I exceeded peers from group II in average daily live weight gain by 60.5 g (td = 8.56; P <0.001); in age of achievement of live weight in 100 kg by 7.0 days (td = 5.26; P<0.001) (Table 2).

Table 2. Fattening and meat qualities of Large White young pigs of different intrabreed differentiation according to the selection index "II"

Indexes	Biometric indexes	Gradations of selection index «II»	
		+0.181 - +3.205	-3.561- -0.249
		<i>group</i>	
		I	II
Average daily gain in live weight during the period of control fattening, g	<i>n</i>	23	19
	$\bar{X} \pm S_x$	807.8±5.55	747.3±4.38
	$\sigma \pm X_\sigma$	26.65±3.930	19.10±3.100
	$Cv \pm Sc_v, \%$	3.29±0.485	2.55±0.413
Age of achievement of live weight in 100 kg, days	$\bar{X} \pm S_x$	173.8±0.89	180.8±1.00
	$\sigma \pm X_\sigma$	4.31±0.635	4.40±0.714
	$Cv \pm Sc_v, \%$	2.47±0.364	2.43±0.394
Fatback thickness at the level of 6-7 thoracic vertebrae, mm	$\bar{X} \pm S_x$	19.5±0.41	22.2±0.32
	$\sigma \pm X_\sigma$	1.99±0.293	1.40±0.227
	$Cv \pm Sc_v, \%$	10.20±1.504	6.36±1.032
Length of chilled carcass, cm	<i>n</i>	16	10
	$\bar{X} \pm S_x$	96.8±0.38	96.2±0.61
	$\sigma \pm X_\sigma$	1.54±0.272	1.83±0.409
	$Cv \pm Sc_v, \%$	1.59±0.281	1.90±0.425
Length of bacon side of chilled half-carcass, cm	$\bar{X} \pm S_x$	85.6±0.61	84.8±0.86
	$\sigma \pm X_\sigma$	2.47±0.437	2.74±0.612
	$Cv \pm Sc_v, \%$	2.88±0.509	3.23±0.722

According to fatback thickness the at the level of 6-7 thoracic vertebrae, the difference between the groups is 2.7 mm (td = 5.29; P <0.001); in the length of the chilled carcass is 0.6 cm (td = 0.84; P>0.05); in the length of the bacon side of the chilled carcass is 0.8 cm (td = 0.76; P>0.05).

Intrabreed differentiation of young pigs according to the Sazer-Fredin index shows that animals from group II exceeded peers from group I in average daily live weight gain by 22.0 g (td = 1.64; P>0.05); in age of 100 kg live

weight by 6,1 days (td = 4.17; P <0.001) (Table 3).

It was found that young pigs, which Sazer-Fredin index ranges from +0.136 to + 4,738 points, are characterized by the smaller fatback thickness at the level of 6-7 thoracic vertebrae (by 1.8 mm; td = 3.52; P<0.01), the bigger length of the chilled carcass (by 0.5 cm; td = 0.71; P>0.05) and the bigger length of the bacon side of the chilled carcass (0.7 cm; td = 0.67; P>0.05).

Table 3. Fattening and meat qualities of Large White young pigs of different intrabreed differentiation according to the Sazer-Fredin index

Indexes	Biometric indexes	Graduations of the Sazer-Fredin index	
		+0.136 - +4.738	-1.017 - -0.102
		<i>group</i>	
		I	II
Average daily gain in live weight during the period of control fattening, g	<i>n</i>	32	10
	$\bar{X} \pm S_x$	775.2±6.70	797.2±11.57
	$\sigma \pm X_\sigma$	37.91±4.738	36.60±8.187
	$Cv \pm Sc_{cv}, \%$	4.89±0.611	4.59±0.560
Age of achievement of live weight in 100 kg, days	$\bar{X} \pm S_x$	178.9±0.84	172.8±1.20
	$\sigma \pm X_\sigma$	4.77±0.596	3.80±0.850
	$Cv \pm Sc_{cv}, \%$	2.67±0.333	2.19±0.489
Fatback thickness at the level of 6-7 thoracic vertebrae, mm	$\bar{X} \pm S_x$	20.4±0.41	22.2±0.32
	$\sigma \pm X_\sigma$	2.35±0.293	1.40±0.313
	$Cv \pm Sc_{cv}, \%$	11.52±1.440	6.30±1.409
Length of chilled carcass, cm	<i>n</i>	20	6
	$\bar{X} \pm S_x$	96.7±0.37	96.2±0.61
	$\sigma \pm X_\sigma$	1.65±0.261	1.83±0.528
	$Cv \pm Sc_{cv}, \%$	1.71±0.270	1.90±0.549
Length of bacon side of chilled half-carcass, cm	$\bar{X} \pm S_x$	85.5±0.58	84.8±0.86
	$\sigma \pm X_\sigma$	2.60±0.411	2.74±0.791
	$Cv \pm Sc_{cv}, \%$	3.04±0.481	3.23±0.933

The calculation of the economic efficiency of the research results shows that the maximum increase in additional products was obtained from Large White young pigs of English origin

(+1.86%), I group of intrabreed differentiation by selection index "I" (+3.39%) and II group of intrabreed differentiation according to the Sazer-Fredin index (+2.11%) (Table 4).

Table 4. Economic efficiency of research results

Group	Average daily gain in live weight during the period of control fattening, kg	Increase in additional products, %	The cost of additional products hryvnia / head USD / head
Total sample	780.4±5.91	-	-
<i>intrabreed differentiation by origin</i>			
II	777.0±6.59	-0.43	-21.30 / -0.67
I	795.2±12.95	+1.86	+89.87 / +2.80
<i>intrabreed differentiation according to the selection index «I»</i>			
II	747.3±4.38	-4.24	-213.01 / -6.65
I	807.8±5.55	+3.39	+163.72 / +5.11
<i>intrabreed differentiation according to the Sazer-Fredin index</i>			
II	797.2±11.57	+2.11	+101.31 / +3.16
I	775.2±6.70	-0.67	-33.30 / -1.04

Note: \* - the selling price of young pigs at the time of research is 47.50 hryvnias or 1.48 US dollars per 1 kg of live weight.

Its cost, received from the sale of 1 head, is +89.87, +163.72 and 101.31 hryvnias or +2.80, +5.11 and +3.16 US dollars, respectively.

## CONCLUSIONS

1. It was found that Large White young pigs from the controlled population at the age of achievement of live weight in 100 kg, in fatback thickness at the level of 6-7 thoracic vertebrae and in the length of the chilled carcass exceed the minimum requirements of the elite class by 13.85% on average.
2. Significant differences between animals of English and Hungarian origin were established in the average daily gain of live weight (2.28%) and in the age of achievement of live weight in 100 kg (3.58%).
3. Young pigs from group I of intrabreed differentiation by selection index "И" and from group II of intrabreed differentiation by Sazer-Fredin index exceeded peers from opposite groups in average daily live weight gain by 7.48-2.75%, in the age of achievement of live weight in 100 kg by 3.87-3.41%.
4. The difference between the groups in fatback thickness at the level of 6-7 thoracic vertebrae, in the length of the chilled carcass and in the length of the bacon side of the chilled carcass varied from 0.51 to 12.16%.
5. The maximum increase in additional products was obtained from the sale of one head of Large White young pigs of English origin (+1.86%), animals from group I of intrabreed differentiation by selection index "И" (+3.39%) and animals from group II of intrabreed differentiation by index Sazer-Fredin (+ 2.11%). Based on the obtained data, it was established that the criterion for selection of highly productive animals is the value of the selection index "I" +0.181 - +3.205, Sazer-Fredin index -1.017 - -0.102.

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