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THE EFFECT OF GENOTYPE, FARM AND SEX ON THE PRODUCTION TRAITS OF FATTENING PIGS OF PEDIGREE BREED GENOTYPES

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Abstract: The study of the production traits of 22 genotypes of fattening pigs was carried out on two pig farms (Farm A and Farm B) in Central Serbia, under the influence of the following factors: farm, genotype and sex of fattening pigs, and pre-slaughter weight. The characteristics of fattening animals included in the research are: warm carcass side growth (WCSG); bacon thickness - rump (FTR); bacon thickness - back (FTB); bacon thickness - rump + back (FTRB); meat yield – carcass sides (JUSKG) and meat yield in percentage (JUSPRO), as well as weight and ratio of French dressing in warm carcass sides (FDKG and FDPRO). Animals of both sexes were used in the trial (female non-castrated rats and surgically castrated males). Total of 1166 fattening animals were included in the trials. Statistical data processing was performed using the Harvey software package. All included factors in the used models show a highly statistically significant effect on the variation of fattening traits ($P<0.01$; $P<0.001$). Animals of genotype DxSL (44.97%) had the highest share of meat in carcass sides, and animals of genotype SL (44.63%) for the trait JUSPRO, while for the trait FDPRO the highest value was recorded for the genotype DXSL (54.45%). In our study, animals of the genotypes (HxD)x(WxD) and Dx(WxD) had the highest values for bacon thickness - 39.95 and 38.32 mm, respectively, which implies lower share of meat in the carcasses. By calculating the genetic and phenotypic correlations, we came to the conclusion that the phenotypic correlation of the carcass side traits was of different strength (from very weak to complete) and different sign, while the genetic correlations were stronger than the phenotypic, so the genetic correlations between the bacon thicknesses FTB and FTR were complete, and between meat yield and traits FTB and FTR complete and negative.

Key words: fatteners, genotype, sex, bacon thickness, meat yield, genetic and phenotypic correlations

Introduction

In the Republic of Serbia, the Rulebook on the Quality of Slaughtered Pigs and the Categorization of Porcine Meat is still in force and used for the evaluation of fattened pigs on the slaughter line (*Regulation "Official Gazette of the SFRY" No. 2 and 12 from 1985*). According to this Rulebook, the meatiness of pork sides is calculated as the sum of the total mass of muscle tissue without the meat of the abdominal-rib part and without the meat of the head. The meatiness of the pig carcass sides is determined at the slaughter line, and the weight of the warm carcass sides and the thickness of the fatty tissue on the back are measured. Adipose tissue with skin is measured on the back and where the smallest thickness of the bacon is in the middle of the back (intercostal space between the 13th and 15th dorsal vertebrae) and on the withers at the place where the muscle M. Gluteus medius grows into adipose tissue. The sum of these measurements represents the thickness of the fatty tissue on the back. Yield and the share of meat in pork carcass sides is obtained using the tables that are an integral part of the Rulebook. The French way of dressing of carcass sides implies separation of the bacon from the area of the abdomen, neck, loin and partially from the thigh/leg and shoulder. The ribs are cut about 10 cm from the spinal column and the legs in the carpal and tarsal joints. The layer of bacon that covers the meat should not exceed 0.5 cm *(Stamenković and Radovanović, 2004)*.

Pig and porcine meat production is conditioned by a large number of parameters. Initial indicators of the quality of pork sides are data on mass and conformation, amount, distribution and mutual relationship of muscle and fat tissue. Carcass and meat quality traits vary under the influence of genetic and environmental factors (breed, sires, rearing method, individual animal, age and weight of animals, sex, castration, nutrition, season, procedures before slaughter, during and after slaughter, etc.). The overall success in the field of genetics, selection, nutrition, reproduction and health care is also assessed by evaluating the quality of carcass sides. In order to achieve genetic improvement of pig quality, it is important to know the variability of production characteristics of quality breeding heads *(Radović et al., 2007*). The values for the traits fat thickness - back (FTB), fat thickness - rump (FTR), sum of fat thickness back and rump (FTBR), yield and share of meat in carcass sides (JUSKG and JUSPRO) obtained by this group of authors show that the examined traits of the progeny varied between the breeds of the sires, genotype and sex. Castrated males, compared to female animals, had on average thicker fat tissue in the middle of the back and rump (19.8

and 18.3 mm compared to 15.5 and 13.2 mm, respectively), lower yield (34.8 vs. 35.9 kg) and the share of meat in carcass sides (42.9 vs. 44.2%), respectively.

In the research of *Radović et al. (2003),* it is established that the genotype of fattening pigs did not influence the variation of the examined traits (age at slaughter, fat thickness - withers, middle of back, rump, back+rump, and percentage of meat in warm carcass sides), while the sires of the examined fatteners influenced the variation of all traits. One of the most important proofs of quality carcass sides is the meat content in carcass sides (*Radović I. et al., 2007).* A larger group of authors in their research show uniform results about the meat content in carcass sides, ranging from 41.71 to 43.32% (*Pušić and Petrović, 2004; Petrović et al., 2006a).*

Determining the meatiness of pig carcasses is important for both pig producers and meat processors, because the meatiness of pig carcasses significantly affects their market price. Pig carcass quality can be evaluated objectively using destructive and non-destructive methods or by using mathematical expressions specially constructed for this purpose *(Lukač et al., 2013).*

The economic efficiency of pig production depends on the duration of fattening, average daily gain, feed -conversion, slaughter efficiency, quality of carcass sides, etc. The breed plays an important role. The large white breed was one of the most common breeds of pigs on former public farms in our country, primarily because of outstanding production performance (*Kosovac*, *2002*), while today the most common breed of pigs in the Republic of Serbia is the Landrace and Large White. The most important traits of the Large White breed are: fast growth, high meateness of the carcass sides, excellent feed conversion and very high quality meat *(Kosovac*, *2002).* At the average length of the carcass side of 97.60 cm, the fat thickness (back and rump) is 26.3 and 35.8 mm, respectively. If the greater variability of some traits (thickness of bacon, weight of the pork chop), than the greater the possibility of their further improvement through selection.

Radović et al. (2013) have determined that the phenotypic correlations between: fat thickness - withers and fat thickness - back are strong and positive (r_p=0.638). The fat thickness - rump and the percentage of meat, that is, the fat thickness – the back and the percentage of meat, are very strong and negative (r_p= -0.880 and - 0.895). Genetic correlations are stronger than phenotypic ones, so that the correlation between the fat thickness - the rump and the back is complete (r_g= 0.930), as well as between the fat thickness - the loin and the back and the meatiness is complete and negative (r_g= -0.979 and -0.982).

The aim of this study was to determine the impact of the farm, genotype and sex of fatteners and body weight at the end of fattening on the following traits: warm carcass side gain (WCSG), fat thickness of – the rump (FTR), fat thickness - the middle of the back (FTB), fat thickness - the rump + the back (FTRB), yield and meat content in carcass sides (JUSKG and JUSPRO), yield and share of French dressing in carcass sides (FDKG and FDPRO).

Materials and Methods

In this study, the production traits of fattening pigs were examined in two pig farms in the Republic of Serbia. The research included 1166 fattening animals of both sexes (female animal and castrated males), 22 genotypes. The trial included the following genotypes of the progeny: purebred Swedish Landrace (SL, n=70), Large white (LW, n=49), and Duroc (D, n=31), as well as crosses SL×LW (n=24), SL×D (n=14), SL×(SL×D×LW) (n=14), SL×(SL×D×D) (n=38), LW×SL (n=86), LW×(SL×LW) (n=71), LW×(SL×D) (n=126), LW×(SL×D×LW) (n= 22), LW×(SL×D×D) (n= 155), (H (Hampshire)×D)×(SL×LW) (n=38), (H×D) ×(SL×D) (n=12), (H×D) ×(SL×D×LW) (n=31), (H×D) ×(SL×D×D) (n= 78), D×SL (n=7), D×(SL×LW) (n=106), D×(SL×D) (n=11), D×LW (n=9), D×(SL×D×LW) (n=93), and D×(SL×D×D) (n=81). Fattening animals come from 29 sires. There were at least 7 progeny per sire.

The body weight of each fattening animal was measured at the end of the research, before pig slaughtering. After slaughter, the weight of the warm carcass sides and the weight of the French dressed warm carcas sides were measured. Fat tissue on the back, together with skin, was measured in the middle of the back (between the 13th and 15th lumbar vertebrae) and at the withers, where the *M. Gluteus medius* muscle grows the most into fat tissue. The sum of these measurements represents the thickness of the fat tissue - the back. The yield and content of meat in the carcass sides of pigs was determined using Tables 1 and 2, which are the integral part of the *Rulebook on the Quality of Slaughtered Pigs and Categorization of Pork ("Official Gazette of SFRY", 1985).*

The following traits were included in the research: warm carcass side gain (WCSG, g), fat thickness – the rump (FTR, mm), fat thickness - the back (FTB, mm), sum of fat thicknesses - the rump and the back (FTRL, mm), yield and the share of meat in cacrass sides (JUSKG, kg and JUSPRO, %), mass and shareion of French dressing of warm carcass sides (FRKG, kg and FRPRO, %). Data processing was performed by applying the appropriate computer program, i.e., by using the procedure of the least squares method (LSMLMW and MIXMDL - *Harvey, 1990*) in order to determine the significance ($P<0.05$) of systematic influences on the examined traits. The models included: genotype of fatteners, farm, sex. The examined traits were corrected/equalized to the average body weight at the end of fattening of 105.9 kg *(Gogić et al., 2019a).*

Two models were used for the analysis of the examined traits, namely:

Model 1.

$$Y_{ijkl} = \mu + G_i + F_j + P_k + b_1 (x_1 - \bar{x}_1) + \varepsilon_{ijkl}$$

where: Y_{ijkl} = observation, i.e. the manifestation of the trait of the *m*-th animal, of the *i*-th genotype, of the $_j$-th farm, and $_k$-th sex, μ = general population average, *G* = genotype of the animal, *F* = farm, *P* = sex, b_1 = linear regression influence of weight at the end of fattening , ε_{ijkl} = random error, *i* = subscript for genotype of the animal (*i* =1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18 .19.20.21.22), *j* = subscript for the farm (*j* =1.2), *k* = subscript for the sex (*k* =1.2), *l* = subscript for progeny.

The model applied to calculate genetic and phenotypic correlations is:

Model 2.
$Y_i = P_i + o_i + \varepsilon_i$

In Model 2, only the factors of sex of the fatteners (fixed) and sire (random) were included due to the limitations of the software package.
The Roemer-Orphal classification presented in the work of *Latinović (1996)* was used to determine the strength of the correlation between the tested traits in Table 1.

Table 1. Roemer-Orphal classification of the strength of correlation between traits *(Latinović, 1996)*

Range of correlation coefficients	The meaning of correlation
0.0-0.1	None
0.1-0.25	Very weak
0.25-0.4	Weak
0.4-0.5	Medium
0.5-0.75	Strong
0.75-0.9	Very strong
0.9-1.0	Complete

Results and Disscussion

All traits included in the trial were corrected to the same weight at the end of fattening (WEF) of 105.9 kg (also in work of *Gogić et al., 2019a*). The average values and standard deviations ($\overline{x}$ ± SD) of the tested traits are shown in Table 2.

Table 2. Average values and variability of studied traits

TRAIT		$\overline{x}$ ± SD
WCSG	Warm carcass side gain, g	406.45±54.56
FTR	Fat thickness - rump, mm	15.94±4.99*
FTB	Fat thickness - back, mm	20.51±5.43
FTRL	Fat thickness - rump +back, mm	36.45±10.02*
JUSKG	Meat yield of carcass sides, kg	36.50±4.59
JUSPRO	Meat yield, %	43.30±1.68
FRKG	French dressing, kg	43.97±5.18
FRPRO	French dressing, %	52.27±3.32

* these two values were obtained in the work of *Gogić et al. (2019a),* using another model for examining the variability of the studied traits of fattening animals

The average value for the trait warm carcass side gain (WCSG) was 406.45 grams, thickness of fat tissue – the rump (FTR) was 15.94 mm, thickness of fat tissue – the back (FTB) 20.51 mm, thickness of total fat tissue – the rump and back (FTRL) 36.45 mm, yield of meat in carcass sides (JUSKG) 36.50 kg, share of meat in carcass sides (JUSPRO) 43.30%, yield of French dressing of carcass sides (FRKG) 43.97 kg and share of French dressing in carcass sides (FRPRO) 52.27%.

Compared to the results of *Sonesson et al. (1998)* we found lower values for body mass and much lower values for FTB compared to this study. The meat yield was 60.3%. In the study by *Gogić et al. (2014),* at a pre-slaughter body weight of 101 kg, the values for FTB, FTR, JUSKG and JUSPRO were respectively 17.22; 15.96; 35.39 and 43.61, whereby it can be concluded that the values are very similar in our research. While observed by genotypes for the Swedish Landrace breed, identical values were measured as in the work of *Gogić et al. (2014).*

Tables 3 and 4 show the influence of genotype of fatteners, farm and sex within Model 1 on the examined fatteners' traits. Observing the genotype of the fattener as a source of variation in traits, it can be seen that the animals of genotype 19 - D×LW had the highest values for the trait WCSG (405.57 g); animals of genotype 13 - (H×D)×(SL×D) have the highest values for the traits FTR and FTB (18.21 mm and 21.74 mm), and therefore also for the trait FTRL (39.95 mm); while the highest values for all four traits of yield and meat share were observed in animals of genotype 16 - D×SL (38.08 kg, 44.97%, 46.17 kg and 54.45%, respectively). Observing the farm as a source of variations in the investigated traits, it was determined that fattening animals raised on farm 1 had higher average values for WCSG (+35.21 g), FTR (+2.22 g) and FTB (+4.00 mm). The established differences in mean values for WCSG, FTR and FTB were statistically highly significant (P<0.001). Contrary to this, animals raised on farm 2 had more meat in carcass sides (37.28 vs. 36.44 kg or 44.23 vs. 43.20%). The established differences of the mean values were highly significant. Taking sex of the animal as a source of variation in traits, it can be seen that female animals had lower fat thickness but higher meat yields in carcass sides, compared to castrated males. The body weight of the animal at the end of fattening (before slaughter) has a linear regression effect on the variation of all investigated traits (P<0.001). By observing the regression effect of body weight at the end of fattening on the tested traits, it can be seen that increasing the body weight at the end of fattening by 1 kg increases the values for all the tested traits, except for the values in percentages for the traits JUSPRO and FRPRO (negative sign).

Table 3. The effect of genotype, farm and sex of animals on studied fatteners' traits (LSM±S.E.)

Source of variation		WCSG[2)], g	FTR, mm	FTB, mm	FTRL, mm	JUSKG, kg	JUSPRO, %
Genotype	1[1)]	393.20±1.05	12.86±0.49	16.34±0.51	29.20±0.94	37.66±0.16	44.63±0.18
	2	402.15±1.76	14.98±0.83	19.19±0.86	34.17±1.58	36.71±0.27	43.58±0.30
	3	401.54±2.27	15.03±1.07	19.83±1.11	34.86±2.05	36.73±0.35	43.66±0.39
	4	393.47±2.28	15.27±1.07	17.89±1.11	33.15±2.05	37.08±0.35	43.93±0.39
	5	401.20±1.37	15.43±0.64	18.78±0.67	34.21±1.23	36.95±0.21	43.79±0.24
	6	396.33±0.94	14.53±0.44	18.80±0.46	33.33±0.84	36.95±0.14	43.84±0.16
	7	397.91±1.02	13.68±0.48	17.49±0.50	31.17±0.92	37.24±0.15	44.17±0.18
	8	396.61±0.77	16.33±0.36	20.10±0.37	36.42±0.69	36.40±0.12	43.20±0.13
	9	398.19±1.25	16.14±0.59	20.54±0.6	36.68±1.12	36.40±0.19	43.18±0.22
	10	394.41±1.80	14.03±0.85	18.40±0.88	32.43±1.61	37.15±0.27	44.06±0.31
	11	398.25±0.68	16.93±0.32	21.18±0.33	38.12±0.61	36.19±0.10	42.94±0.12
	12	396.38±1.41	14.61±0.66	19.00±0.69	33.61±0.27	36.99±0.21	43.89±0.24
	13	400.52±2.46	18.21±1.16	21.74±1.20	39.95±2.21	35.65±0.37	42.47±0.43
	14	397.21±1.55	12.84±0.73	17.18±0.76	30.02±1.40	37.49±0.24	44.46±0.27
	15	393.81±1.03	15.41±0.48	19.14±0.50	34.55±0.92	36.87±0.16	43.72±0.18
	16	394.52±3.21	11.68±1.51	15.23±1.57	26.91±2.89	38.08±0.49	44.97±0.56
	17	397.50±0.86	14.10±0.40	18.20±0.42	32.30±0.77	37.03±0.13	43.98±0.15
	18	396.81±2.56	16.83±1.21	21.48±1.25	38.32±2.30	36.17±0.39	42.91±0.44
	19	405.57±2.83	14.73±1.33	19.61±1.38	34.33±2.54	37.03±0.43	43.95±0.49
	20	395.40±1.56	14.73±0.73	19.55±0.76	34.28±1.40	36.91±0.24	43.72±0.27
	21	395.79±0.94	15.05±0.44	19.08±0.46	34.14±0.85	36.83±0.14	43.70±0.16
	22	400.08±0.94	16.38±0.44	21.15±0.46	37.53±0.85	36.31±0.14	43.07±0.16
Farm	1	415.19±0.40	16.10±0.19	21.08±0.19	37.18±0.36	36.44±0.06	43.20±0.07
	2	379.98±0.64	13.88±0.30	17.08±0.31	30.97±0.58	37.28±0.10	44.23±0.11
Sex	1[4)]	396.90±0.50	13.54±0.23	17.43±0.24	30.97±0.45	37.34±0.07	44.29±0.08
	2	398.27±0.46	16.44±0.22	20.74±0.22	37.18±0.41	36.37±0.07	43.15±0.08
BWEF (b)		3.718[3)]***	0.158***	0.169***	0.327***	0.331***	-0.015***

[1)] Genotype: 1-SL. 2-SL×LW. 3-SL×D. 4-SL×(SL×D×LW). 5-SL×(SL×D×D). 6-LW×SL. 7-LW×(SL×LW). 8-LW×(SL×D). 9-LW. 10-LW×(SL×D×LW). 11-LW×(SL×D×D). 12-(H×D)×(SL×LW). 13-(H×D)×(SL×D).14-(H×D)×(SL×D×LW).15-(H×D)×(SL×D×D). 16-D×SL. 17-D×(SL×LW). 18-D×(SL×D). 19-D×LW. 20-D. 21-D×(SL×D×LW). 22-D×(SL×D×D); [2)]

WCSG- warm carcass side gain; FTR- thickness of fat tissue – the rump; FTB- thickness of fat tissue – the back; FTRL- thickness of fat tissue – the rump +back; JUSKG-meat yield in carcass sides; JUSPRO-meat yield in percentage; BWEF- body weight at the end of fattening; 3) ***=P<0.001; 4) Sex 1 females; Sex2 castrated males

The values for the traits JUSKG and JUSPRO were slightly higher for the SL genotype, as well as SL×LW genotype, compared to the research by *Radović et al. (2007).*

Table 4. The effect of genotype, farm and sex of animals on studied fatteners' traits (LSM ±S.E.)

Source of variation		FRKG 2), kg	FRPRO, %
Genotype	1 1)	43.52±0.29	51.81±0.33
	2	44.07±0.48	52.48±0.56
	3	43.98±0.62	52.24±0.73
	4	43.13±0.62	51.09±0.73
	5	43.00±0.37	51.26±0.44
	6	43.58±0.26	51.82±0.30
	7	44.78±0.28	53.24±0.33
	8	43.14±0.21	51.35±0.25
	9	43.84±0.34	52.10±0.40
	10	43.90±0.49	52.24±0.57
	11	43.14±0.19	51.31±0.22
	12	45.05±0.38	53.57±0.45
	13	42.59±0.67	50.67±0.79
	14	44.35±0.42	52.66±0.50
	15	43.32±0.28	51.49±0.33
	16	46.17±0.88	54.45±1.03
	17	44.44±0.23	52.82±0.27
	18	44.93±0.70	53.24±0.82
	19	44.36±0.77	52.76±0.90
	20	43.90±0.42	52.17±0.50
	21	44.06±0.26	52.37±0.30
	22	43.89±0.26	52.20±0.30
Farm	1	44.53±0.11	52.90±0.13
	2	43.39±0.18	51.58±0.21
Sex	1 4)	44.90±0.13	53.38±0.16
	2	43.03±0.13	51.10±0.15
BWEF (b)		0.336 3)***	-0.091***

1) Genotype: 1-SL. 2-SL×LW. 3-SL×D. 4-SL×(SL×D×LW). 5-SL×(SL×D×D). 6-LW×SL. 7-LW×(SL×LW). 8-LW×(SL×D). 9-LW. 10-LW×(SL×D×LW). 11-LW×(SL×D×D). 12-(H×D)×(SL×LW). 13-(H×D)×(SL×D).14-(H×D)×(SL×D×LW).15-(H×D)×(SL×D×D). 16-D×SL. 17-D×(SL×LW). 18-D×(SL×D). 19-D×LW. 20-D. 21-D×(SL×D×LW). 22-D×(SL×D×D); 2) FRKG-French dressing in kg; FRPRO-French dressing in percentages; BWEF-body weight at the end of fattening; 3) ***=P<0.001; Sex 1 females; Sex2 castrated males

In the presented model, female animals had thinner fat tissue but a higher yield and share of meat compared to castrated males, which is in agreement with the research of *Radović et al. (2007)* and *Gogić et al. (2014),* where the values for the share of meat are almost identical to the results presented in the work of these two groups of authors. Estimated meatiness on live female animals of the Swedish Landrace breed in the research of *Gogić et al. (2019b)* shows a value of 58.94% which is significantly higher compared to our work for the trait FRPRO measured according to the Rulebook.

Table 5 shows the levels of significance of the influences included in the models on the studied traits of fattening animals.

Table 5. Statistical significance (level of significance) of the influences included in the models on the studied traits of fattening animals

Source of variation (the influence)		WCSG[1)]	FTR	FTB	FTRL	JUSKG	JUSPRO	FRKG	FRPRO
Model 1	Genotype	***[2)]	***	***	***	***	***	***	***
	Farm	***	***	***	***	***	***	***	***
	Sex	**	***	***	***	***	***	***	***
	R^2	0.977	0.380	0.441	0.440	0.924	0.260	0.807	0.354

[1)]WCSG- warm carcass side gain; FTR- thickness of fat tissue – the rump; FTB- thickness of fat tissue – the back; FTRL- thickness of fat tissue – the rump +back; JUSKG-meat yield in carcass sides; JUSPRO-meat yield in percentage; FRKG-French dressing in kg; FRPRO-French dressing in percentages; R^2-coefficient of determination; [2)] **=P<0.01; ***=P<0.001

In the Model, the genotype of the fattening animals, the farm and the sex of the animals were included as sources of variation, and it was determined that all three factors have a statistically significant effect on the variation of all traits of the fatteners (P<0.01; P<0.001). The coefficient of determination R^2 showed that the effects included in the Model (fatteners' genotype, farm and sex) explained the variation of WCSG with 97.7%, the variation of FTR with 38.0%, the variation of FTB with 44.1%, the variation of FTRL with 44.0%, the variation of JUSKG with 92.4%, the variation of JUSPRO with 26.0%, FRKG variation with 80.7% and FRPRO variations with 35.4%. So, the variations of WCSG and JUSKG were mostly explained by factor effects, and the least the variation of JUSPRO.

The application of this model showed that the sex of animals had a statistically significant effect on the traits of FTB, FTR, FTRL, JUSKG and JUSPRO, which is in agreement with the research of *Petrović et al. (2006b).*

The sex and genotype of the fattening animals in the Model had a statistically significant effect on the variation of all the examined traits of the fattening animals, which is in agreement with the research of *Radović et al. (2007).*

Table 6 shows the genetic and phenotypic correlations, where genetic correlations are presented above the diagonal, while phenotypic correlations are presented below the diagonal.

Table 6. Genetic and phenotypic correlations

TRAITS	BWEF	WCSG	FTR	FTB	FTRL	JUSKG	JUSPRO	FRKG	FRPRO
BWEF		0.866**	0.567**	0.547**	0.563**	0.937**	-0.296**	0.886**	-0.013NS
WCSG	0.951**		0.689**	0.773**	0.748**	0.714**	-0.530**	0.898**	0.269**
FTR	0.446**	0.475**		0.944**	0.981**	0.254**	-0.930**	0.416**	-0.219**
FTB	0.457**	0.532**	0.827**		0.990**	0.232**	-0.934**	0.537**	0.084**
FTRL	0.472**	0.528**	0.952**	0.960**		0.245**	-0.945**	0.493**	-0.044NS
JUSKG	0.955**	0.886**	0.189**	0.203**	0.205**		0.056NS	0.837**	0.011NS
JUSPRO	-0.138**	-0.208**	-0.861**	-0.854**	-0.897**	0.161**		-0.246**	0.061*
FRKG	0.885**	0.874**	0.204**	0.260**	0.244**	0.903**	0.071*		0.452**
FRPRO	-0.348**	-0.266**	-0.541**	-0.458**	-0.520**	-0.218**	0.429**	0.125**	

The correlation coefficient for 5 and 1% certainty (d.f. =1000) is 0.062 and 0.081. Anything less than 0.062 is NS, between 0.062 and 0.081 is *, over 0.081 is **. NS=P>0.05; *=P<0.05; **=P<0.01;

In the observation of the phenotypic correlations in the research of *Sonesson et al. (1998)* a strong negative phenotypic correlation (r_P=-0.67) between fat tissue thickness and meatiness is presented, while in our research a negative phenotypic correlation between these two traits was found, with the difference that the correlation is very strong (r_p=-0.854). Meatiness shows a very strong genetic correlation with back fat thickness (r_g=-0.77), while in our research the genetic correlation is complete and also negative (rg=-0.934).

The phenotypic correlation of the traits of the carcass sides was of different strength (from very weak to complete) and signs, which is in agreement with the research of *Petrović et al. (2006b),* where this group of authors establishes a positive weak or very weak correlation between the warm carcass side gain and the fat thickness (FTB and FTR), while in our research the correlations were positive but stronger (strong correlation). A very weak, negative and statistically significant correlation was established between WCSG and JUSKG, i.e. WCSG and JUSPRO traits, so that a more intensive growth led to an increase in the thickness of fat tissue and a decrease in the amount or content of meat in warm carcass sides *(Petrović et al., 2006b),* while in our research, in the case of the WCSG:JUSKG correlation, a positive and very strong connection was established. The value of phenotypic correlation between FTB and FTR traits was positive and strong (+0.610), while in our research it was also positive but very strong (+0.827). A very strong and positive phenotypic correlation exists between FTB and FTR traits, in study by *Radović et al. (2013)* showing a positive and complete phenotypic correlation. Also, the same group of authors states a negative and complete correlation between fat tissue thickness and meat yield, while in our research the values are negative and the correlations are very strong. Genetic correlations are stronger than phenotypic ones, so between FTB and FTR thickness of fat tissue they were complete and complete and negative between meat yield and FTB and FTR traits, which is in agreement with the research of *Radović et al. (2013).*

Conclusion

This experiment aimed to determine the variation of carcass sides quality traits of 22 genotypes originating from 29 boars. There were a total of 1166 fattening animals of both sexes (females and castrated males) from two farms. The influence of the fattenrs' genotype, farm and sex on the variation of the traits of the fattening animals was examined. Based on the results obtained from the experiment, we concluded the following: by applying this Model, it was determined that the genotype, sex of the fattening animal and the farm had a statistically very high influence on all the examined traits of the fattening animals. The genotypes DxSL (44.97%) had the highest share of meat in the carcass sides and genotype SL (44.63%) for the trait JUSPRO, while for the trait FRPRO the highest value was measured for the genotype DXSL (54.45%). In the research, the highest thickness of fat tissue had the genotypes (HxD)x(SLxD) and Dx(SLxD) - 39.95 and 38.32 mm, respectively, leading to lower share of meat in the carcasses. Genetic and phenotypic correlations ranged from very weak (for certain traits they do not even occur) to complete correlations, with different signs. For a more precise determination of the yield of meat in carcass sides, it is necessary to apply a combination of non-destructive and destructive methods. In other words, we should take into account the results obtained on live animals with the help of ultrasound devices for measuring fat tissue thickness and meatiness, as well as the results obtained at the slaughter line by applying the Rulebook and dissection of carcass sides.

Uticaj genotipa. farme i pola na proizvodne osobine tovljenika plemenitih genotipova svinja

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Rezime

Na dve farme svinja (farma A i farma B) u Centralnoj Srbiji sprovedeno je ispitivanje proizvodnih osobina 22 genotipa tovljenika pod uticajem sledećih faktora: farma. genotip i pol tovljenika. i masa na pre klanja. Osobine tovljenika koje su uključene u istraživanje su: prirast tople polutke (WCSG); debljina slanine na krstima (FTR); debljina slanine na leđima (FTB); debljina slanine krsta+leđa (FTRL); prinos mesa u polutkama (JUSKG) i prinos mesa u procentima (JUSPRO). U ogledu su korišćena oba pola (ženska nekastrirana grla i muška hirurški kastrirana grla). Obuhvaćeno je 1200 tovljenika ispitivanjima. Statistička obrada podataka je sprovedena korišćenjem kompjuterskog programa Harvey. Svi uključeni faktori u korišćenim modelima utiču visoko statistički značajno na variranje osobina tovljenika ($P<0.01$; $P<0.001$). Izračunavanjem genetskih i fenotipskih korelacija došlo se do zaključka da je fenotipska povezanost osobina polutki bila je različite jačine (od jako slabe do potpune) i predznaka. dok su genetske korelacije jače od fenotipskih tako da su potpune između debljina slanine FTB i FTR a potpune i negativne između prinosa mesa i osobina FTB i FTR.

Ključne reči: tovljenici, genotip, pol, debljina slanine, prinos mesa, genetske i fenotipske korelacije

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