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THE EFFECT OF GENOTYPE AND YEAR ON TRAITS OF PERFORMANCE TESTED GILTS

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Abstract: Objective of this research was to establish the effect of animal genotype, year of measuring and birth on traits of performance tested gilts: age at the end of the test (AET), life daily gain (LDG), back fat thickness 1 and 2 (BFT1 and BFT2), depth of back muscle (MLD) and assessed share of meat in carcass. Of total number of animals (n=3600) included in the research, 1709 animals were of genotype SL and 1891 of genotype ♀SLx♂LY. In regard to the birth year of tested gilts, the distribution was following: n_{2006}=296, n_{2007}=895, n_{2008}=934, n_{2009}=803, n_{2010}=589 and n_{2011}=83 gilts. In regard to testing year, the distribution of gilts was as follows: n_{2007}=682, n_{2008}=875, n_{2009}=962, n_{2010}=697 and n_{2011}=384 gilts. The effects of test year and birth year were established ($P<0.001$) for all studied traits, whereas the effect of genotype was not established ($P>0.05$).

Key words: gilts, genotype, ultra sonogram measurements, PigLog 105

Introduction

Important precondition in the work on genetic improvement of the quality of pigs is knowledge of the variability of production traits of breeding animals. For that purpose, studies are carried out and data recorded for all traits included in the selection procedure. Efficiency in pig production is evaluated based on three parameters: annual sow productivity, feed conversion ratio and meat yield of animals. Quantative and qualitative carcass traits depend on selection methods. It is known that certain quantitative pig traits are not equaly passed on, which means that the possibilities of their improvement through selection are different. Heritability coefficients for growth traits and traits of carcass side quality are medium to strong (*Hermesch et al., 2000; Chen et al., 2002; Gorjanc et al., 2003;*

Radović et al., 2003; Petrović et al., 2006). Increased selection for meat content causes significant decrease of the content of subcutaneous fat *(Bahelka et al., 2007)*. Breeding value of young animals can be used for evaluation of parent breeding value, and in that way the best parent combinations selected for breeding and eventually significantly higher production and better quality of pig meat can be ensured in a country (*Jukna et al., 2009)*. In the study of the average values of production traits of sons and daughters, *Petrović et al., (2002)* have established expressed effect of sires ($P<0,01$ and $P<0,05$) on age and average daily gain (from birth to the end of the test) with same average final body mass (103,0 kg).

Hence, there is the need for continuous study and monitoring of the intensity of growth and meat indicators in order to be able to determine as precisely possible the breeding value of the offspring, i.e. their parents.

Material and Methods

Study included two genotypes – Swedish Landrace and crosses F_1 generation Swedish Landrace x Large Yorkshire (SLxLY; the first one is the dam). Of total number of animals (n=3600), the study included 1709 animals of SL genotype and 1891 animals of genotype SLxLY. In regard to the birth year of tested gilts the distribution was following: n_{2006}=296, n_{2007}=895, n_{2008}=934, n_{2009}=803, n_{2010}=589 and n_{2011}=83 gilts, and in regard to the year of measuring, the gilt distribution was following: n_{2007}=682, n_{2008}=875, n_{2009}=962, n_{2010}=697 and n_{2011}=384 gilts. Measuring of the back fat thickness and depth of *musculus longissimus dorsi* (MLD) was carried out on animals weighing 90 to 110 kg. Ultra-sonogram apparatus (PIGLOG 105) was used in measuring on following anatomical points: back fat thickness in loin region (BFT1) between 3rd and 4th lumbar vetebrae (measured from the last lumbar vetebrae), 7 cm laterally to the back line; back fat thickness and depth of MLD in the back region (BFT2 and MLD) between 3rd and 4th rib from the reaR, 7 cm laterally to the back line. Data was processed using the adequate computer program, i.e. method of Last squares *(LSMLMW and MIXMDL-Harvey, 1990)*. The following were included into models: animal genotype (G), year of measuring (GM) and year of birth (GR).

$$Y_{ijkl} = \mu + G_i + GM_j + GR_k + e_{ijkl}$$

Results and Discussion

Intensity of growth and indicators of meat yield of performance tested gilts, during five year research (year 2007 to 2011), are presented in tables 1 and 2. Data presented in table 1 show that F_1 crosses finished the test sooner, had higher gain and thinner back fats compared to Swedish Landrace animals. By observing

the values according to test years, i.e. to the end of test, we can see that animals from the first to the fifth year prolonged the test from year to year (GM1:GM5; 198:212 days), and hence the life daily gain decreased (GM1:GM5; 500:465 g). During the same test period also decrease of the back fat thickness (BFT1 and BFT2) by 6.9 mm and 5.3 mm, respectively, was observed. In the same testing period the decrease in back fat thickness was recorded. By observing the data according to birth year (GR1:GR6) of gilts there is a same trend of decrease of values for back fat thickness BFT1 and BFT2. For said traits the effect of year of measuring and year of birth ($P<0.001$) was established but not the influence of the genotype ($P>0.05$).

Table 1. The effect of genotype and year on intensity of growth and back fat thickness (LSM±S.E.)

Sources of variation		AET[3)], days	LDG, g	BFT1, mm	BFT2, mm
μ ± S.E.		203.56±0.56	486.21±1.43	17.66±0.41	13.45±0.41
Genotype	1[1)]	204.46±1.92	483.71±4.74	18.01±0.76	13.46±0.67
	2	202.65±1.91	488.72±4.73	17.31±0.76	13.43±0.67
P[2)]		NS	NS	NS	NS
Year of measuring	1	197.85±0.95	500.09±2.36	21.37±0.49	16.28±0.46
	2	199.67±0.81	496.08±2.01	19.65±0.45	15.28±0.44
	3	203.96±0.75	485.04±1.87	17.17±0.44	12.87±0.43
	4	204.19±0.81	484.71±2.03	15.65±0.45	11.84±0.44
	5	212.10±1.03	465.15±2.55	14.47±0.51	10.97±0.49
P		***	***	***	***
Birth year	1	198.86±1.49	496.82±3.68	20.91±0.63	16.40±0.57
	2	201.95±0.89	489.82±2.22	19.33±0.47	15.01±0.45
	3	198.57±0.72	498.93±1.80	17.98±0.43	13.39±0.43
	4	199.56±0.71	496.69±1.79	17.31±0.43	13.09±0.43
	5	213.09±0.82	463.10±2.05	16.40±0.46	11.85±0.44
	6	209.31±1.08	471.94±2.69	14.04±0.52	10.93±0.49
P		***	***	***	***

[1)] 1-SL, 2- LYxSL; [2)] NS=P>0,05; *=P<0,05; **=P<0,01; ***=P<0,001; [3)]AET-age at the end of the test; LDG-life daily gain; BFT1- back fat thickness 1; BFT2- back fat thickness

By observing the effect of studied factors on depth of MLD and assessed meat yield of gilts presented in table 2, we can see that greater depth of MLD and lower meat yield were recorded in pure breed animals (SL) compared to F_1 crosses. Reason for lower assessed meat yield of SL genotype gilts is in greater back fat thickness (BFT1 and BFT2). The effect of genotype on said traits was not observed ($P>0.05$).

With the decrease of back fat thickness values from year to year (table 1) so the depth of MLD increased (table 2). Birth year and year of measuring influenced the depth of MLD ($P<0.01$ and $P<0.001$) and assessed share of meat in carcass ($P<0.001$).

Table 3. The effect of genotype and year on MLD depth and share of meat (LSM±S.E.)

Sources of variation		MLD[3)], mm	Share of meat, %
μ ± S.E.		52.79±0.22	55.04±0.39
Genotype	1[1)]	53.06±0.76	54.89±0.66
	2	52.52±0.76	55.18±0.66
P[2)]		NS	NS
Year of measuring	1	51.40±0.38	51.76±0.45
	2	51.87±0.32	53.09±0.43
	3	53.08±0.30	55.60±0.42
	4	53.60±0.32	56.86±0.43
	5	54.00±0.41	57.87±0.47
P		***	***
Birth year	1	51.49±0.43	52.57±0.56
	2	52.38±0.33	53.50±0.44
	3	52.91±0.28	54.87±0.41
	4	53.05±0.29	55.32±0.41
	5	53.17±0.35	56.30±0.43
	6	53.74±0.59	57.67±0.48
P		**	***

[1)] 1-SL, 2- LYxSL; [2)] NS=P>0,05; *=P<0,05; **=P<0,01; ***=P<0,001;
[3)]MLD-depth of back muscle

In the present study, the effect of genotype on studied traits was not established (P>0.05) whereas the year of measuring and year of birth of gilts influenced all studied traits (P<0.01 and P<0.001). *Szyndler-Nędza et al., (2010)* and *Gogić et al., (2012)* have concluded that differences between studied genotypes of performance tested gilts (LY, L, D and P) were significant (P≤0.05; P≤0.01 and P≤0.001) for all studied traits, which is contrary to present results. The effect of year on back fat thickness and depth of muscle in performance tested F_1 gilts of Polish Large yorkshire and Polish Landrace (PLW×PL and PL×PLW) was studied by *Nowachowicz et al., (2009)*. In this study the significant and highly significant effect of year on back fat thickness P2 (measured behind the last rib, 3 cm from the medial surface) has been established, which is in accordance with our research (P<0.001). Also, consistent to our study, *Michalska et al., (2008)* have established the effect (P≤0.01) of year of measuring (from 1995 to 2004) on back fat thickness (P_2 and P_4), depth of muscle and share of meat in the carcass. However, contrary to present results, *Petrović et al., (2002)* have not established significant variations (P>0,05) of back fat thickness and share of meat between years when animals were tested, but they have established the effect of year (P<0.01) on age at the end of the test and daily gain which is consistent to our study.

Conclusion

Based on obtained results it was established that F_1 crosses finished the test sooner, had higher gain and thinner back fat compared to Swedish Landrace

animals. By observing the values according to year of measuring, i.e. to the end of test, we can conclude that animals in the period through first five years of measuring have prolonged the test from year to year, which influenced the decrease of life daily gain. In the same period of measuring, the decrease in back fat thickness (BFT1 and BFT2) by 6.9 mm and 5.3 mm was observed. By observing the values according to year of birth (GR1:GR6) of gilts, the same trend of decrease of values for back fat thickness BFT1 and BFT2 is observed. For all studied traits the effect of year of measuring and year of birth ($P<0.001$) was established and no effect of genotype ($P>0.05$).

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Uticaj genotipa i godine na osobine performans testiranih nazimica

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Rezime

Cilj ovog istraživanja je da se utvrdi uticaj genotipa grla, godine merenja i rođenja grla na osobine performans testiranih nazimica: uzrast na kraju testa (UKT), životni dnevni prirast (ŽDP), debljina slanine 1 i 2 (DSL1 i DSL2), dubina leđnog mišića (MLD) i procenjeni udeo mesa u trupu. Od ukupnog broja (n=3600) istraživanjem je obuhvaćeno 1709 grla genotipa ŠL i 1891 grla genotipa ♀ŠLx♂VJ. Po godini rođenja testiranih nazimica distribucija je bila sledeća: n_{2006}=296, n_{2007}=895, n_{2008}=934, n_{2009}=803, n_{2010}=589 i n_{2011}=83 nazimice. Dok je po godinama testiranja distribucija nazimica bila sledeća: n_{2007}=682, n_{2008}=875, n_{2009}=962, n_{2010}=697 i n_{2011}=384 nazimice. Za sve ispitivane osobine utvrđen je uticaj godine merenja i godine rođenja ($P<0.001$) dok uticaj genotipa nije utvrđen ($P>0.05$).

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