

**PIGLET'S WEIGHT AT BIRTH VERSUS GROWTH INTENSITY
OF THE PURE BREED AND HYBRID GILTS****V. Vidović, V. Višnjić, D. Lukač, Ljuba Štrbac, Jovanka Krnjaić,
Miluška Ivanović, M. Stupar, R. Novković****Summary**

Efficiency of production directly related on the quality of gilts in the farm. For this reason it would be necessary to replace non-productive sows. By monitoring and control of the growth intensity in the performance test make possibility to provide selection effect and get gilts adequate age and weight at insemination. The paper present analyzes of growth traits from birth until the end of the performance test. The investigations included 825 gilts, of which 414 Landrace and 411 Yorkshire, which were obtained from 17 sires (9 of Landrace and 8 of Yorkshire breed). Data of 886 hybrid (F1) gilts between them are progeny of 10 boars (5 of each breed of L and Y). The gilts that had a smaller weight at birth, showed a smaller daily gain and body weight realized at the end of the test. Lactation duration were of 31 at purebred and 29 at hybrid one days. The weights at weaning were over 7 kg, biggest at hybrid females. It can be concluded that heterosis effect was shown. During the test of 85 days, the realized average weight was 76 kg, with a gain of 0.90 kg for Landrace gilts, while Yorkshire had smaller one (72 kg) with smaller daily gain (0.84 kg). For the same period Hybrid gilts grown 78 kg and an average age life gain of 0.85 kg, with age of gilts of 161 days, Landrace gilts reached weight of 108 kg, with an average life gain of 0.67 kg, while the Yorkshire gilts reached weight of 103 kg, with an average life gain of 0.62 kg. At the same time Hybrid gilts had 105 kg with life gain of 0.65 kg. Tests of significance showed that the sire, breed and weight at birth of piglets have a highly significant impact on most of the observed traits and represent a significant source of phenotypic variability in growth traits of tested gilts. It seem that optimum weight of piglets at birth is 1,4 kg and more. So, management and feeding regime of gilts and sows are very important during gestation period to get piglets with higher birth weight.

Key words: piglets weight at birth, growth of gilts in the test, weight gain, nucleus farm.

Introduction

The negative genetic relationships between fertility and milk production traits on the one hand and traits meatiness on the other one,

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provide to the definition of specialized pig breeds and lines of high fertility, which are used in the production of hybrid pigs as a final product. The selection criteria of parents in practice are significantly different. As a consequence of these in practice findings have been created and specialized pig farms (commercial farms and the nucleus one). The nucleus of the farms is great grandparents (GGP), grandparents (GP) and parents (P), where strictly biosecure regulated. There are only healthy animals with a minimum number of vaccinations. Replaced rate of sows on nucleus farms is about 150% and 300% for boars. Commercial farms with a slightly weaker biosafety regulations, higher number of vaccinations used for the production of hybrid pigs with a minimum expenditure of labour and cost price (Vidović et al., 2011; Vidović and Šubara, 2011). At European proportions, and in our crystallized are fertile breeds, Landrace and Yorkshire (Bidanel 2010; Bergsma et al., 2010). They are used for the production of F₁ - Hybrid mothers that crossing with the terminal boar breed Duroc, or Pietrain as well as their F₁ product (synthetic boars that containing recombination of favourable genes for the most important traits) whose descendants are the final product. The efforts of farmers to choose the combination of breeds that give the best results. These genotypes of pigs are far more sensitive than older more traditional genotypes, and therefore great attention must be given to the correct upbringing gilts on the farm (Young and Aherne, 2005).

The purpose of this study is to determine influences of birth weight of piglets on the growth rate of Landrace and Yorkshire gilts and their F₁ females Hybrids in the performance test. Using certain data information will be analyzed the differences between those breeds including Hybrids for a growth traits, even they are under the same selection criteria. The monitoring and control of the growth intensity in the performance test make possibility to provide selection effect and get gilts adequate age and weight at insemination. Examination will be carried on the traits of growth from birth until the end of the test gilts.

Materials and Methods

The investigations included 825 gilts, of which 414 Landrace and 411 Yorkshire, which were obtained from 17 sires (9 of Landrace and 8 of Yorkshire breed). Hybrid gilts 886 has been produced from 10 sires. Research has been done on three Nucleus farms with GGP and GP parents. The study observed following traits: weight at birth, daily gain at suckling, weight at weaning, daily gain before start of test, weight at test, daily gain at test, weight at the end of the test and life gain. Effect of sire, breed and weight at birth on observed traits were done by LS method, model I:

$$Y_{ijkl} = \mu + O_i + B_{ij} + W_{ijk} + F_{ijkl} + E_{ijklm}$$

where is:

Y_{ijkl} - observed traits;

μ - mean of observed traits;

O_i - sire effect;

B_{ij} - breed effect within sire;

W_{ijk} - weight effect within breeds and sires;

F_{ijkl} - farm effects;

E_{ijkl} - random error.

Results and Discussion

Phenotypic results of Landrace, Yorkshire and their F_1 Hybrid gilts which were selected using the same criteria, from birth to the end of the performance test are presented in table 1 to 3.

Table 1. -TEST RESULTS OF LANDRACE GILTS
 Tablica 1. - REZULTATI TESTA U LANDRASA

Weight at birth, kg	1,1	1,2	1,3	1,4	1,5	>1,5	Average 1,37
Lactation length, days,	31	31	31	31	31	31	31
Weight at weaning, kg	7,4	7,6	8,1	9,3	9,1	10,0	8,7
Daily gain at suckling, kg	0,23	0,24	0,21	0,24	0,22	0,27	0,23
Age at test beginning , days	72	73	74	76	77	72	74
Weight at test beginning kg	30,3	30,7	31,7	33,7	36,2	31,3	32,3
Daily gain before start of test, kg	0,44	0,44	0,56	0,44	0,47	0,44	0,54
Duration of test, days	85	85	85	85	85	85	85
Gain during test, kg	73,0	78,3	77,6	75,6	74,2	78,1	76,1
Daily gain on test, kg	0,86	0,92	0,91	0,89	0,87	0,92	0,90
Age of gilts, days	159	159	161	162	164	159	161
Weight at the end of the test, kg	105	109	109	109	109	109	108
Life gain, kg	0,66	0,69	0,68	0,67	0,66	0,69	0,67

Weight at birth in both Landrace and Yorkshire, including F₁ Hybrids showed effect on later results. Daily gain was similar in all categories. Lighter piglets grown slightly, but well, compare to the contemporaries with higher weight. One of the reasons may be greater attention of labourer in rearing these piglets (permanently sorting suckling piglets and litter, and use of other mothers for an additional 3-5 days of lactation). Literature sources showed that most of the reproductive traits are of low heritability coefficient, including the weight at birth, where the coefficient of heritability ranging from 0.07 -0.12 (Vidović et al., 2012; Vidović and Lukač, 2010; Hogberg and Rydhmer, 2000; Hermesch et al., 2001), where proportion of additive gene a little. Weight at weaning was not less than 7 kg. According to Vidović et al., (2011) after 28 days spent in the farrowing, piglets not be allowed be an average of 8 kg lighter at weaning. The piglets are under 6 kg at weaning would need weaning, but under an adequate extended lactation sows, 5 – 7 days more suckling. To do this it is necessary to everyday sorting of piglets and sows. All piglets that are lagging behind compared to their peers in their litter should be moved and placed under good dairy sows. Weight at birth in all three genotypes showed similar tendency. Little heterosis were presents at F₁ gilts.

During the test of 85 days, the average realized weight was 76 kg, with a gain of 0.90 kg for Landrace gilts, while the Yorkshire gilts had lower body weight (72 kg) and lower daily gain (0.84 kg). Hybrid gilts were somewhere between (74 kg and 0,85 kg daily gain). Gilts that had a smaller weight of all genotypes at birth, showed a smaller daily gain and smaller body weight realized at the end of the test. With increasing weight at birth, increases daily gain and body weight in all three genotypes of gilts. Nevertheless it is therefore very important to respect the optimal technology of feeding sows during gestation.

With an average age of gilts of 161 days, Landrace gilts reached weight of 108 kg, and average life gain of 0.67 kg, while the Yorkshire realized weight of 103 kg, the average life gain of 0.64 kg. At the same time F₁ reached 105 kg with life gain of 0,65 kg. According to the recommendations of Vidović and Šubara (2011) with the age of 140-150 days, and weighing about 80 kg, gilts should ensure the presence of sexually mature boar, so that gilts showed 1-3 oestruses for next 60-70 days. Stimulation in phase of puberty provides one more ovulation ovum, than in the group without stimulation.

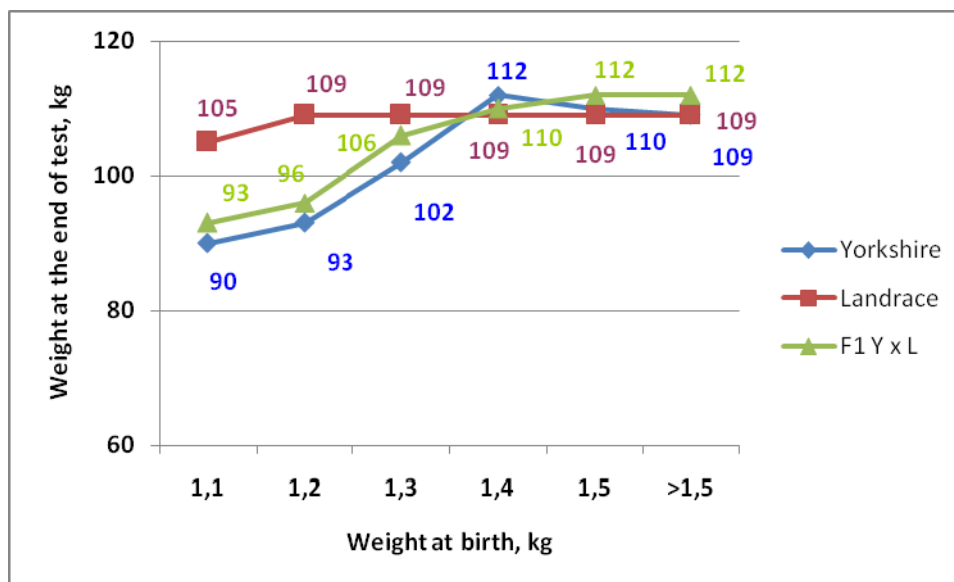
Table 2.- TEST RESULTS OF YORKSHIRE GILTS
Tablica 2. - REZULTATI TESTA U JORKŠIRA

Weight at birth, kg	1,1	1,2	1,3	1,4	1,5	>1,5	Average 1,37
Lactation length, days,	31	31	31	31	31	31	31
Weight at weaning, kg	7,0	8,1	8,1	9,6	9,6	9,1	8,6
Daily gain at suckling, kg	0,22	0,26	0,26	0,30	0,30	0,29	0,27
Age at test beginning , days	73	73	75	77	77	78	75
Weight at test beginning kg	23,0	24,4	27,8	35,2	35,6	34,4	30.1
Daily gain before start of test, kg	0,32	0,33	0,37	0,46	0,46	0,44	0,41
Duration of test, days	85	85	85	85	85	85	85
Gain during test, kg	65,4	67,9	72,5	76,6	75,2	75,6	72,2
Daily gain on test, kg	0,77	0,80	0,85	0,90	0,88	0,89	0,84
Age of gilts, days	160	160	161	162	162	163	161
Weight at the end of the test, kg	90	93	102	112	110	109	103
Life gain, kg	0,56	0,58	0,63	0,69	0,68	0,67	0,64

Table 3.- TEST RESULTS OF F₁ GILTS
 Tablica 3. - REZULTATI TESTA U F₁ NAZIMICA

Weight at birth, kg	1,1	1,2	1,3	1,4	1,5	>1,5	Average 1,37
Lactation length, days,	29	29	29	29	29	29	29
Weight at weaning, kg	7,5	7,8	8,0	9,5	9,7	9,5	8,6
Daily gain at suckling, kg	0,25	0,27	0,28	0,33	0,33	0,33	0,30
Age at test beginning , days	73	73	75	77	77	78	75
Weight at test beginning kg	23,7	24,6	29,8	35,2	35,7	35,2	30,7
Daily gain before start of test, kg	0,32	0,34	0,40	0,46	0,46	0,45	0,41
Duration of test, days	85	85	85	85	85	85	85
Gain during test, kg	69,3	71,4	76,2	74,8	76,3	76,8	74,1
Daily gain on test, kg	0,78	0,80	0,85	0,88	0,89	0,89	0,85
Age of gilts, days	159	159	160	163	163	164	161
Weight at the end of the test, kg	93	96	106	110	112	112	105
Life gain, kg	0,58	0,60	0,66	0,67	0,69	0,68	0,65

Graph 1. - EFFECT OF BIRTH WEIGHT ON FINAL SIZE AT THE END OF TEST
 Grafikon 1. - UTICAJ MASE PRASADI PRI ROĐENJU NA MASU NA KRAJU TESTA



It conclusion can be said, the optimal weight at birth should be 1,4kg and more (Graph 1). Birth weight has significant influence to the final one and economy of sow production. Most is important to optimize feeding regime during pregnancy and also weight and age of gilt at fertile insemination.

The tables 4-6 represent the statistical significances of the test differences of the effect of sires, breed and birth weight on the observed traits of the tested gilts. Based on the results in table 3 can be concluded that sires have a highly significant impact on most of the observed traits and represent a significant source phenotypic variation in growth traits of tested gilts. On this basis, given the possibility to choose of fathers who are genetically superior. In the models for genetic evaluation an individual, genetic source of variation is usually the sire effect who is considered to be random, which is based on that selection and evaluation of breeding values and genetic programme changes, using sire variance and covariance components. But, if fathers are involved in the model as a fixed factor, then one can obtain information about the differences between fathers and the possible intensity of selection within a breeds or family (Vidović, 2011). If one want to improve production traits in certain populations, then the choice superior boars-fathers in the breeds is very important. It can be seen (table 4) that the breed highly significant influenced on the weight at birth, accomplished weight and daily gain in the test, accomplished weight and life gain gilts as well. Breed itself did not influence the weight and gain at weaning, even slightly better results of F1 gilts. But the expression of maternal effect during the suckling period is recognized. Also, the weight at birth has significantly influence on the weight and gain to weaning, daily gain before start of test and accomplished weight of gilts while the other observed traits. Weight at birth had no significant influence on examined traits (tables 5 and 6).

Table 4. - ANALYSIS OF SIRE EFFECT
 Tablica 4. - ANALIZA UTICAJA OCA

	DF	SS	MS	F	P
Weight at birth, kg	26	1,40	0,26	8,93	0,0000**
Weight at weaning, kg	26	29,89	4,98	4,06	0,0611 ^{NZ}
Daily gain at suckling, kg	26	0,36	0,00	1,67	0,1906 ^{NZ}
Daily gain before start of test, kg	26	0,18	0,06	4,76	0,0012**
Weight at test kg	26	1463,8	247,3	6,82	0,0001**
Daily gain at test, kg	26	0,18	0,03	8,82	0,0001**
Weight at the end of the test, kg	26	2457,8	379,4	6,04	0,0000**
Life gain, kg	26	0,08	0,03	7,67	0,0000**

$P < 0,01^{**}$; $P < 0,05^{*}$; $P > 0,05^{NZ}$; DF – degree of freedom; SS – sum of squares; MS – middle of the squares; F – value; P – probability;

Table 5. - EFFECT OF BREED AND MATING COMBINATION
 Tablica 5. - UTJECAJ PASMINE I KOMBINACIJE PARENJA

	DF	SS	MS	F	P
Weight at birth, kg	2	0,81	0,64	17,29	0,0008**
Weight at weaning, kg	2	0,93	0,71	0,29	0,5920 ^{NZ}
Daily gain at suckling, kg	2	0,005	0,004	1,93	0,1685 ^{NZ}
Daily gain before start of test, kg	2	0,07	0,05	6,84	0,0101*
Weight at test, kg	2	467,8	457,7	9,37	0,0037**
Daily gain at test, kg	2	0,08	0,06	9,65	0,0037**
Weight at the end of the test, kg	2	954	951	10,12	0,0018**
Life gain, kg	2	0,05	0,04	14,41	0,0003**

Table 6. - EFFECT OF PIGLETS WEIGHT AT BIRTH
 Tablica 6. - UTJECAJ MASE NA ROĐENJU

	DF	SS	MS	F	P
Weight at weaning, kg	5	27,77	4,96	2,53	0,0006**
Daily gain at suckling, kg	5	0,36	0,008	2,95	0,0180*
Daily gain before start of test, kg	5	0,16	0,03	2,88	0,0266*
Weight at test, kg	5	295,4	48,4	0,89	0,5167 ^{NZ}
Daily gain at test, kg	5	0,04	0,008	0,89	0,5167 ^{NZ}
Weight at the end of the test, kg	5	1578	257	2,86	0,0160*
Life gain, kg	5	0,03	0,004	1,31	0,2867 ^{NZ}

Age and weight of gilts at occurrence puberty and the fertile oestrus, were subjected to stronger interaction between genetic basis (Krnjačić et al., 2012; Cotton, 2001; King 2002) and the many par genetic factors (Evans and O'Doherty, 2001; Peltoniemi et al., 2005). Today, management requires the pig to be fertile gilts inseminated in their third oestrus puberty, when they are older than 240 days, with weight 140 - 150 kg at minimum and backfat thickness minimum 18 mm. (Agroceres, 2003; Close, 1997). Vidović and Šubara (2011) recommended for insemination of gilts with the age of 230-260 days, weight of 135-170 kg in the third oestrus, with back fat thickness of 16 - 20 mm, so that weight at farrowing could vary between 190-220 kg.

Conclusion

Gilts with lower birth weight, even purebred or crossbred, have lower daily gains and body weight at weaning of piglets. They spend more days to reach final body weight. Duration lactation of 31 days in purebred and 29 for F₁, weight at weaning was not less than 7 kg. It comes out, the optimal weight at birth should be 1,4kg and more. Birth weight has significantly influenced to the final one (test result) and economy of sow production. On bases of data analyses it is necessarily to optimize feeding regime during pregnancy and also weight and age of gilt before fertile insemination.

Increasingly weight at birth, automatically increased daily gain and body weight in all genotypes of gilts. Sires had a highly significant impact on most of the observed traits and represent a significant source of phenotypic variation in like of growth traits of tested gilts. Breed also had a highly significant influenced the weight at birth, accomplished weight and daily gain in the test, accomplished weight and life gain gilts. However, breed did not influence the weight and gain at weaning, the expression of maternal effects during the suckling period. There is no statistical difference between genotypes for certain traits. Also, the weight at birth was significantly influenced the weight and gain to weaning, daily gain before start of test and accomplished weight of gilts while the other observed traits, weight at birth had no influence.

Therefore, the technology of production and exploitation of reproductive gilts should use the following key principles: (1) select gilts from genetic quality of parents, (2) provide adequate housing, (3) implement adequate food in different stages of development, (4) stimulation of gilts with boar, (5) implement effective the technology oestrus detection and artificial insemination, (6) insemination gilts in third oestrus with certain age and weight, (7) to ensure maximum efficient health care gilts, (8) provide optimal feeding regime during gestation period.

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UTJECAJ MASE PRASADI PRI ROĐENJU NA INTENZITET PORASTA ČISTOKRVNIH I HIBRIDNIH NAZIMICA

Sažetak

Proizvodnja rasplodnih grla, prasadi i tovljenika u farmi direktno ovisi od kvalitetnih nazimica, jer upravo sa njima treba zamijeniti neproduktivne krmače. Kontrolom intenziteta porasta u testu, dobivaju se nazimice adekvatne dobi i tjelesne mase na osjemenjavanju. Nazimice koje nemaju adekvatnu dob i masu ne donose profit farmeru (manje od 30 zalučene prasadi po krmači godišnje), već samo gubitke, i zbog toga su veoma važna mjerenja koja se vrše u toku uzgoja rasplodnih nazimica. U radu su analizirana svojstva porasta od rođenja do kraja testa 825 nazimica (414 landras nazimica, i 411 jorkšir) te 886 F1 nazimica iz međusobnog parenja ove dvije pasmine, dobivene od 9 nerastova pasmine landras i 8 pasmine jorkšir te 10 nerastova (5 landras i 5 jorkši). Nazimice koje su imale manju masu na rođenju, imale su i manji dnevni prirast i manju postignutu tjelesnu masu na kraju testa. Trajanje laktacije od 31 dana je uobičajeno u primjeru čistih pasmina u nukleusu te 29 dana za F1 grla. Masa na zalučenju nije bila ispod 7 kg kod najlakše prasadi na rođenju u svih genotipova. Proizilazi da je za dobar rezultat, optimalna težina prasadi na rođenju minimum 1,4 kg i više. Za vrijeme trajanja testa od 85 dana, prosječna ostvarena masa bila je 76 kg, sa prirastom od 0,90 kg kod landras nazimica, dok su jorkšir nazimice ostvarile manju tjelesnu masu (72 kg) i manji dnevni prirast (0,84 kg). F1 nazimice imale su rezultat između roditeljskih genotipova landrasa i jorkšira (74kg i 0,85kg dnevni prirast). Sa prosječnom dobi nazimica od 161 dana, landras nazimice su postigle masu od 108 kg, sa prosječnim životnim prirastom od 0,67 kg, dok su jorkširke ostvarile masu od 103 kg, sa prosječnim životnim prirastom od 0,64 kg. Hibridne nazimice su za isto vrijeme ostvarile 105 kg i 0,65kg životnog prirasta. Testovi značajnosti su pokazali da otac, pasmina tj. kombinacija parenja i masa na rođenju imaju visoko signifikantan utjecaj na većinu posmatranih osobina te predstavljaju značajan izvor fenotipske varijabilnosti osobina porasta testiranih nazimica.

Ključne riječi: masa prasadi na rođenju; prirast; nukleus farma.

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