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# GROWTH INTENSITY OF THE FERTILE BREED GILTS IN THE NUCLEUS PIG FARM

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**Abstract:** Production in the farm directly depends on the quality of gilts. 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 present paper analyses of growth traits from birth until the end of the performance test. The investigations included 205 gilts, of which 104 Landrace and 101 Yorkshire, which were obtained from 7 sires (4 of Landrace and 3 of Yorkshire breed). 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 of 32 days, weight at weaning was not less than 7 kg. 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 (71 kg) and so smaller daily gain (0.84 kg). With an average age of gilts of 160 days, Landrace gilts reached weight 108 kg, with an average life gain of 0.67 kg, while the Yorkshire gilts reached weight of 101 kg, with an average life gain of 0.62 kg. Tests of significance showed that the sire, breed and weight at birth 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.

**Key words**: growth of gilts in the test, weight gain, nucleus farm

## Introduction

The findings of the negative genetic relationships between fertility and milk production traits on the one hand and traits meatiness on the other one, have led to the formation of specialized pig breeds and lines of high fertility, which are used in the production of hybrid pigs as a final product. Of course, the selection

criteria in the selection of parents are significantly different. As results of these findings have been created and specialized pig farms (commercial farms and the nucleus one). The nucleus of the farm is grand 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 these farms is about 150% and 300% for boars. Commercial farms with slightly weaker biosafety regulations, higher number of vaccinations used for the production of hybrid pigs with a minimum expenditure of labour and cost price (*Vidovic et al.,* 2011*; Vidovic and Subara,* 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 $F_1$ mothers that crossing with the terminal boar breed Duroc, Hampshire or Pietrain as well as their $F_1$ 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 breeding 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 the growth rate of Landrace and Yorkshire gilts in the performance test. Using certain data information will be analysed the differences between those breeds 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 205 gilts, of which 104 Landrace and 101 Yorkshire, which were obtained from 7 sires (4 of Landrace and 3 of Yorkshire breed). Nucleus farm is capacity of 800 GGP sows. The study observed following traits: weight at birth, daily gain at suckling, weight at weaning, daily gain before start of performance test, weight at 108 kg, daily gain, weight at the end of the same test then life gain. Effect of sire, breed and weight at birth on observed traits were done by LS method, model I:

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

where:
$Y_{ijkl}$ - observed traits;
$\mu$ - mean of observed traits;
$O_i$ – sire effect;

$B_{ij}$ – breed effect within sire;
$W_{ijk}$ – weight effect within breeds and sires;
$E_{ijkl}$ – random error.

## Results and Discussion

Phenotypic results of Landrace and Yorkshire gilts which were selected using the same criteria, from birth to the end of the performance test are presented in table 1 and 2.

**Table 1. Test results for Landrace gilts**

| Weight at birth, kg | 1,1 | 1,2 | 1,3 | 1,4 | 1,5 | >1,5 | Average 1,37 |
|---|---|---|---|---|---|---|---|
| Lactation length, days, | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| Weight at weaning, kg | 8,0 | 8,5 | 8,1 | 9,1 | 8,1 | 10,0 | 8,5 |
| Daily gain at suckling, kg | 0,21 | 0,22 | 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 | 31,3 | 30,7 | 31,3 | 33,7 | 35,2 | 30,3 | 32,1 |
| Daily gain before start of test, kg | 0,54 | 0,55 | 0,56 | 0,55 | 0,57 | 0,54 | 0,55 |
| 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 at end of the test, days | 158 | 159 | 161 | 162 | 164 | 158 | 160 |
| Weight at the end of the test, kg | 104 | 109 | 109 | 109 | 109 | 109 | 108 |
| Life gain, kg | 0,65 | 0,68 | 0,67 | 0,66 | 0,66 | 0,67 | 0,67 |

Weight at birth in both Landrace and Yorkshire showed effect on later results. The daily gain in all categories shown differences, but there are not statistically significant. Lighter piglets unexpectedly grow well. 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 5 days of lactation). Follow literature sources, 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 (*Vidovic et al.,* 2012; *Vidovic and Lukac,* 2010; *Hogberg and Rydhmer,* 2000*; Hermesch et al.,* 2001; *Petrovic et al.,*1991, *Radujkovic et al.,* 2005.), where proportion of additive gene a little. Weight at weaning was not less than 7 kg. According to *Vidovic 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.

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 (71 kg) and lower daily gain (0.84 kg). Gilts that had a smaller weight of 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 both genotypes of gilts. It is therefore very important to respect the optimal technology of feeding sows during gestation.

With an average age of gilts of 160 days, Landrace gilts reached weight of 108 kg, and average life gain of 0.67 kg, while the Yorkshire realized weight of 101 kg, the average life gain of 0.62 kg. According to the recommendations *Vidovic and Subara* (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 60-70 days. Stimulation in phase of puberty provides one more ovulation ovum, than in the group without stimulation.

**Table 2. Test results for Yorkshire gilts**

| Weight at birth, kg | 1,1 | 1,2 | 1,3 | 1,4 | 1,5 | >1,5 | Average 1,37 |
|---|---|---|---|---|---|---|---|
| Lactation length, days, | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| Weight at weaning, kg | 7,0 | 8,0 | 8,0 | 9,7 | 9,1 | 8,5 | 8,4 |
| Daily gain at suckling, kg | 0,19 | 0,21 | 0,20 | 0,24 | 0,23 | 0,21 | 0,21 |
| Age at test beginning , days | 73 | 73 | 75 | 77 | 77 | 78 | 75 |
| Weight at test beginning kg | 22,0 | 23,4 | 28,8 | 35,0 | 35,6 | 34,6 | 29,9 |
| Daily gain before start of test, kg | 0,37 | 0,39 | 0,49 | 0,56 | 0,60 | 0,57 | 0,49 |
| Duration of test, days | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| Gain during test, kg | 65,7 | 67,6 | 71,5 | 76,5 | 74,6 | 74,6 | 71,7 |
| Daily gain on test, kg | 0,77 | 0,79 | 0,84 | 0,90 | 0,88 | 0,88 | 0,84 |
| Age of gilts at end of the test, days | 159 | 159 | 160 | 163 | 163 | 164 | 161 |
| Weight at the end of the test, kg | 88 | 91 | 100 | 112 | 110 | 109 | 102 |
| Life gain, kg | 0,54 | 0,57 | 0,62 | 0,67 | 0,66 | 0,66 | 0,62 |

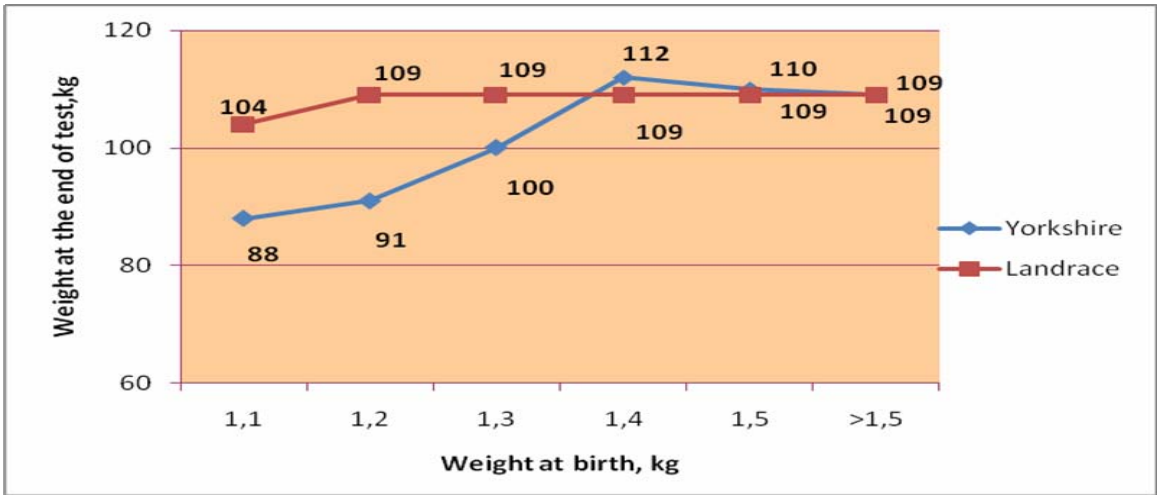


**Figure 1. Effect of birth weight on final size at the end of test**

It comes out, the optimal weight at birth should be 1,4 kg and more (Figure 1). Birth weight was shown influence to the final one then economy of sow production, same as study of *Zekic et al*., 2011. So it is important to optimize feeding regime during pregnancy and also weight and age of gilt before fertile insemination.

The tables 3 – 5 represent the significances of the test differences of the effect of father, 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 (*Vidovic,* 2011). If we want to improve production traits in their 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. 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 at end of the test while the other observed traits.

Weight at birth had no significant influence on examined traits (weight at test, daily gain at test and life gain, table 5).

**Table 3. Analysis of sire effect**

| | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Weight at birth, kg | 6 | 1,40 | 0,23 | 6,93 | 0,0000** |
| Weight at weaning, kg | 6 | 29,89 | 4,98 | 2,06 | 0,0611 NZ |
| Daily gain at suckling, kg | 6 | 0,02 | 0,00 | 1,47 | 0,1906 NZ |
| Daily gain before start of test, kg | 6 | 0,18 | 0,03 | 3,76 | 0,0012** |
| Weight at test kg | 6 | 1363,8 | 227,3 | 4,82 | 0,0001** |
| Daily gain at test, kg | 6 | 0,18 | 0,03 | 4,82 | 0,0001** |
| Weight at the end of the test, kg | 6 | 2157,8 | 359,6 | 4,04 | 0,0000** |
| Life gain, kg | 6 | 0,08 | 0,01 | 4,67 | 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 4. Analysis of breed effect**

| | **DF** | **SS** | **MS** | **F** | **P** |
|---|---|---|---|---|---|
| Weight at birth, kg | 1 | 0,61 | 0,61 | 16,29 | 0,0008** |
| Weight at weaning, kg | 1 | 0,73 | 0,73 | 0,28 | 0,5920 NZ |
| Daily gain at suckling, kg | 1 | 0,004 | 0,004 | 1,91 | 0,1685 NZ |
| Daily gain before start of test, kg | 1 | 0,05 | 0,05 | 6,78 | 0,0101* |
| Weight at test, kg | 1 | 447,9 | 447,9 | 8,67 | 0,0037** |
| Daily gain at test, kg | 1 | 0,06 | 0,06 | 8,67 | 0,0037** |
| Weight at the end of the test, kg | 1 | 943 | 943 | 10,03 | 0,0018** |
| Life gain, kg | 1 | 0,04 | 0,04 | 13,45 | 0,0003** |

**Table 5. Analysis of weight at birth effect**

| | **DF** | **SS** | **MS** | **F** | **P** |
|---|---|---|---|---|---|
| Weight at weaning, kg | 5 | 26,76 | 4,46 | 1,83 | 0,0006** |
| Daily gain at suckling, kg | 5 | 0,36 | 0,006 | 2,65 | 0,0180* |
| Daily gain before start of test, kg | 5 | 0,13 | 0,02 | 2,58 | 0,0266* |
| Weight at test, kg | 5 | 285,7 | 47,6 | 0,87 | 0,5167 NZ |
| Daily gain at test, kg | 5 | 0,03 | 0,006 | 0,87 | 0,5167 NZ |
| Weight at the end of the test, kg | 5 | 1516 | 253 | 2,71 | 0,0160* |
| Life gain, kg | 5 | 0,02 | 0,004 | 1,25 | 0,2867 NZ |

Age and weight of gilts at occurrence puberty and the fertile oestrus, were subjected to stronger interaction between genetic basis (*Krnjaic 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 second or third oestrus puberty, when they are older than 240 days, with weight 140 - 150 kg and backfat thickness minimum18 mm (*Agroceres*, 2003; *Close,* 1997). *Vidovic and Subara* (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 was 190-220 kg.

# Conclusion

Gilts with lower birth weight have lover daily gains and body weights at weaning of piglets and spend more day to final body weight. Duration lactation of 32 days, weight at weaning was not less than 7 kg. It comes out, the optimal weight at birth should be 1,4 kg and more. Birth weight has significant influence to the final one (test result) and economy of sow production. So, it is important to optimize feeding regime during pregnancy and also weight and age of gilt before fertile insemination.

With increasing weight at birth, was increased the body weight at the end of test in both genotypes of gilts. Sires had a highly significant impact on most of the observed traits and represent a significant source phenotypic variation in like of growth traits of tested gilts. In analysis, breed had a highly significant influence on the weight at birth, accomplished weight and daily gain in the test, the same as weight and life gain gilts. However, breed did not influence the weight and gain at weaning and the expression of maternal effects during the suckling period. The weight at birth was shown significant influence to the weight and gain at weaning, same as daily gain before start of test and accomplished weight of gilts while the other observed traits, weight at birth had no influence.

On the basis of said up to now, the intensity growth gilts is one of the important parameters of genetic progress and success of swine production. Breeding gilts is of great importance for the profitability of production. Insemination of gilts inadequate age and weight, inadequate reproductive status, and bad health, has resulted in a significantly smaller number of piglets weaned per sow during her total reproductive exploitation. 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, (7) to

ensure maximum efficient health care gilts, (8) provide optimal feeding regime during gestation period.

## Intenzitet porasta nazimica plodnih rasa u Nukleus zapatu

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## Rezime

Proizvodnja na jednoj farmi direktno zavisi od kvalitetnih nazimica, jer upravo sa njima treba da zamenimo neproduktivne krmače. Praćenjem i kontrolom intenziteta porasta u testu, dobijamo nazimice adekvatne starosti i telesne mase na osemenjavanju. Nazimice koje nemaju adekvatnu starost i masu ne donose profit farmeru, već samo gubitke, i zbog toga su veoma važna merenja koja se vrše u toku uzgoja priplodnih nazimica. U radu su analizirana svojstva porasta od rođenja do kraja testa 205 nazimica (104 landras nazimica, i 101 jorkšir), dobijene od 4 nerasta rase landras i 3 rase jorkšir. Nazimice koje su imale manju masu na rođenju, imale su manji dnevni prirast i ostvarenu telesnu masu na kraju testa. Trajanjem laktacije od 32 dana, što je uobičajeno u primeru čistih rasa u nukleusu, masa na zalučenju nije bila ispod 7 kg. Proizilazi da je optimalna težina prasadi na rođenju minimum 1,4 kg i više. Za vreme trajanja testa od 85 dana, prosečna ostvarena masa bila je 76 kg, sa prirastom od 0,90 kg kod landras nazimica, dok su jorkšir nazimice ostvarile manju telesnu masu (71 kg) i manji dnevni prirast (0,84 kg). Sa prosečnom starosti nazimica od 160 dana, landras nazimice su postigle masu od 108 kg, sa prosečnim životnim prirastom od 0,67 kg, dok su jorkšir nazimice postigle masu od 101 kg, sa prosečnim životnim prirastom od 0,62 kg. Testovi značajnosti su pokazali da otac, rasa i masa na rođenju imaju visoko signifikantan uticaj na većinu posmatranih osobina i predstavljaju značajan izvor fenotipske varijabilnosti osobina porasta testiranih nazimica.

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