Genetic trends for backfat thickness and time on test for Landrace and Large White breed in Vojvodina

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Abstract

The aim of the paper was to analyse genetic trends for backfat thickness and time on test in Landrace and Large White pigs in Vojvodina. Data included 5,872 data records from field test for Landrace and 5,934 for Large White from 2008 to 2014. Residual maximum likelihood method was used to obtain variance components for analyzed traits. Breeding values were estimated using animal model. In order to obtain genetic trends, breeding values were summarised by year. Genetic trends were negative and favourable for backfat thickness in both breeds, while there was no substantial changes in genetic trends for time on test.

Key words: pigs, backfat, time on test, genetic trends

Introduction

Selection of domestic animals for economically important traits is the central concern of animal breeding. In pig production, economically important traits can be divided into productive and reproductive traits. Some of the most important productive traits are backfat thickness and growth rate. Genetic improvement of productive traits is relatively fast, due to moderate to high heritabilities of traits (Li and Kennedy, 1994). Today, lean meat content based on selection for thicker backfat is often the major criterion for forming price of the pigs to the producer. Efficiency of pig production is, among other numerous factors, determined by growth rate of the animal, which can be expressed as age necessary to achieve desired final or slaughter weight, or as daily gain. Selection on the growth rate enables production of fast growing animals in next generations and directly improves efficiency of production. Despite of standings that selection on productive traits has reached its optimum (Suzuki, 2005), it still remains one of main components in breeding schemes for pigs. Backfat thickness and growth rate can be affected by many genetic and environmental factors. Usually, data on backfat thickness and growth rate of the animal are collected in performance or field test. Growth rate can be expressed as time on test, i.e. time necessary for animal to achieve desired weight or as daily gain.

The aim of the paper was to analyse genetic trends for backfat thickness and time on test in Landrace and Large White breed in pig population in Vojvodina.

Materials and methods

Data were obtained by Head breeding organisation for pigs in Vojvodina. In total, 6,524 data records from field test for Landrace and 6,953 for Large White were included in data set in period from 2008 to 2014 from 25 large scale farms. Due to illogical values or missing records, criteria for data editing were set after the preliminary analysis. Records of animals which spent less than 120 and more than 360 days on test were discarded. Also, data records for the animals with less than 70 kg and more than 120 kg were excluded from the analysis. All herds with less than five animals within particular year were excluded from the study, too.
total, round 10% data records were excluded in each breed. Descriptive statistics was obtained by SAS 9.1. statistical package (SAS, 2004) and are shown in Table 1.

Table 1: Summary statistics for BF (mm) and TT

<table>
<thead>
<tr>
<th>Breed</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landrace</td>
<td>5,872</td>
<td>17.96</td>
<td>5.41</td>
<td>5,872</td>
<td>213.73</td>
<td>29.46</td>
</tr>
<tr>
<td>Large White</td>
<td>5,934</td>
<td>16.76</td>
<td>4.88</td>
<td>5,934</td>
<td>191.36</td>
<td>37.19</td>
</tr>
</tbody>
</table>

Residual maximum likelihood method (REML) implemented in VCE6 (Groeneveld et al, 2008) software was used to obtain (co)variance components for analyzed traits. Breeding values were estimated using PEST software (Kovač and Groeneveld, 1990). In order to obtain genetic trends, breeding values were summarised by year. Following linear model was used to obtain genetic parameters and breeding values:

$$ y = X_b + Z_l + Z_a + e $$

where $y$ is the vector of observations; $X$, $Z_l$, $Z_a$ are incidence matrices for fixed, herd-year, litter and additive effect, $b$, $l$, and $a$ are the vectors of unknown parameters of above effects; $e$ is the vector of residual effects.

### Results and discussion

Genetic parameters for both traits were in accordance with previous studies for analyzed traits from field test.

Table 2. Estimates of phenotypic variance ($V_{ph}$) and ratios for common litter environmental ($l$) and additive genetic ($h^2$) for backfat thickness and time on test

<table>
<thead>
<tr>
<th>Breed</th>
<th>$V_{ph}$ BF</th>
<th>$V_{ph}$ TT</th>
<th>Litter ($l^2$) BF</th>
<th>Litter ($l^2$) TT</th>
<th>Animal ($h^2$) BF</th>
<th>Animal ($h^2$) TT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landrace</td>
<td>8.68</td>
<td>325.14</td>
<td>0.10</td>
<td>0.06</td>
<td>0.30</td>
<td>0.35</td>
</tr>
<tr>
<td>LW</td>
<td>2.88</td>
<td>285.34</td>
<td>0.12</td>
<td>0.40</td>
<td>0.29</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Popovac et al. (2014) found heritabilities of 0.356 for backfat thickness, implying that these traits belong to the group of mean heritability traits, while Brkić et al. (2001) determined a high heritability of these traits. Urankar et al. (2012) and Imboonta et al. (2007) determined a mean heritability of these traits in their studies. Rothscild and Ruvinsky (1998) reported heritability of 0.49 for backfat thickness and 0.31 for daily gain. Similar values for heritability were found by Bidanel et al. (1994).

Genetic trends for backfat thickness in both analysed breeds were negative and favourable in the whole analysed period and implies successful selection on this trait. This is the result of continued implementation of the main breeding program by the main breeding organizations in the Department of Animal Husbandry, Faculty of Agriculture, Novi Sad. In order to make genetic improvement for analysed traits more faster, attention should be directed to the quality of data and pedigree.

However, genetic trends for time on test do not show clear decrease, especially in Large White pigs (Figure 3 and Figure 4). Decreasing pattern can be observed in the end of analysed period. More efficient selection and more successful selection results could be achieved by introducing modern selection procedures such as BLUP in routine selection.

Moreover, selections decision can be evaluated using methods developed by Garcia-Cortes et al (2008) and Gorjanc et al (2011), where genetic trends can be decomposed by selection paths.
Future work should also include analysis of the connectedness between farms due to its importance for across herd comparison of estimated breeding values and analysis of reliability of the genetic evaluation.
Genetic trends for backfat thickness are favourable and show decreasing pattern. However, favourable trend was not observed in time on test, especially in Large White breed. In order to obtain stronger genetic improvement, additional efforts should be done in improving data and pedigree quality.

**Conclusions**

Genetic trends for backfat thickness are favourable and show decreasing pattern. However, favourable trend was not observed in time on test, especially in Large White breed. In order to obtain stronger genetic improvement, additional efforts should be done in improving data and pedigree quality.

**References**


**Figure 4. Genetic trend for time on test thickness for Large White pigs**

Conclusions

Genetic trends for backfat thickness are favourable and show decreasing pattern. However, favourable trend was not observed in time on test, especially in Large White breed. In order to obtain stronger genetic improvement, additional efforts should be done in improving data and pedigree quality.

References


