Genetic relationships between meat productivity and reproductive performance in Berkshire pig

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Introduction

Many breeding programs were constructed including growth traits of piglet and reproductive traits of sows because those traits directly influence farmer’s income. Genetic relationships between piglet growth and sow reproductive performance were often reported unfavorable.

We have studied performance traits, carcass traits and reproductive traits. The genetic relationships between those traits have, however, not been studied in the Berkshire population.

The objective of this study was to estimate the genetic parameters for meat productivity and reproductive performance in Berkshire pig.

Materials and Methods

Berkshire pigs in Okayama were founded on base population introduced from Kagoshima prefecture in 1978. The data used in this study were collected in Japan on 4,773 purebred Berkshire (2,458 males and 2,315 females) pigs at the Okayama Prefectural Animal Husbandry and Research Center. Records of sows in present study were collected on 564 litters from 114 dams.

Statistical analysis

Estimation for genetic parameters was performed by bi-trait model using VCE-5. The statistical models for WW, W60, BFT60 and LEA60 are as follows:

\[ y_i = Xb_i + Za_i + Sc_i + e_i \]

where \( y_i \) is a vector of observations, \( b_i \) is a vector of fixed effects including a contemporary group, sex effect (except in WW), parity effect and covariate including weaning age for only WW. For the \( i \)th trait, \( a_i \) is a vector of random animal effects, \( c_i \) is a vector of random common environmental effects and \( e_i \) is a vector of random errors; \( X, Z \) and \( S \) are incidence matrices relating records.

The statistical models for AGF, BFTF, LEAF and carcass traits are as follows:

\[ y_i = Xb_i + Za_i + Sp_i + e_i \]

where \( y_i \) is a vector of observations, \( b_i \) is a vector of fixed effects including a contemporary group by served year and season and covariate including parity, weaning age, and litter size at birth or weaning, \( a_i \) is a vector of random animal effects, \( p_i \) is a vector of random permanent environmental effects and \( e_i \) is a vector of random errors; \( X, Z \) and \( S \) are incidence matrices relating records.

Results and Discussion

Table 1 shows number of observations, means, S.D., C.V., estimated heritabilities and permanent environmental effects for the reproductive traits. The estimates of heritabilities and permanent environmental effect were all low.

Table 2 shows estimates of genetic correlations (\( r \) SE) between reproductive traits. Table 3 and table 4 show estimates of genetic correlations between reproductive and carcass traits. The genetic correlations of a litter weight at birth and at weaning with loin eye area on carcass; TWB = total weight of piglets born alive per litter; TNB = total number of piglets born per litter; TWW = total weight of piglets at weaning per litter; TNW = total number of piglets at weaning per litter.

Conclusion

- Genetic relationships of a litter weight at birth and at weaning weight, body weight at 60 days of age and age at 105kg on growth traits are favorable for improvement.
- Genetic relationships of a litter weight at birth and at weaning with loin eye area and some subcutaneous fat thickness on carcass traits also showed favorable estimates.
- From above the results, comparing within reproductive traits, a litter weight at birth and at weaning should be chosen for improving reproductive performance of sows.

Table 1. Estimate of heritabilities (\( h^2 \) SE) permanent environmental effect (\( p^2 \) SE) for reproductive traits.

Table 2. Estimates of genetic correlations (\( r \) SE) between reproductive traits.

Table 3. Estimates of genetic correlations (\( r \) SE) between reproductive and performance traits.

Table 4. Estimates of genetic correlations (\( r \) SE) between reproductive and carcass traits.