Genetic parameters for longitudinal feed intake and weight gain in Durocs

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INTRODUCTION

Data collected from electronic feeder stations allow for repeated measurements of individuals. This data allows for longitudinal analyses of growth and feed intake at a low cost.

OBJECTIVES

The purpose of this study was to examine the genetic parameters of growth and feed intake in several periods using data from those stations.

MATERIALS AND METHODS

Electronic feeder stations

Daily feed intake (DFI, g)
Daily gain (DG, g)

One Duroc nucleus line
- Smithfield Premium Genetics Group
- June 2004 through January 2007

Weight data edited as described by Zumbach et al. (2008)

1,919 Duroc boars:
-Average on-test ages of 79 to 150 d / weights of 15 to 160 kg
-Off-test ages ranged from 104 to 167 d / weights of 27 to 180 kg
-102 pens / ad libitum access to feed / one feeder for each pen

GIBBS2F90 (Misztal et al, 2002)

Weekly averages + Repeatability models

Periods 1, 2, and 3 for DFI and DG : 81-109, 110-138, and 139-167 d of age

◆A multivariate model (six traits) ~age as covariate:

$$y_{ijkt} = pg_{jt} + bl_{kt} + a_{it} + pe_{it} + e_{ijkt}$$

y: observations
bl: random litter effect
pe: permanent environmental effect
pg (year-week-pen): fixed pen group effect
a: additive effect
e: random residual effect

Table 1. Number of records and unadjusted means

Trait	Records	Mean	SD
DFI1, g	2,632	2,324	784
DFI2, g	4,773	2,820	862
DFI3, g	4,579	2,914	965
DG1, g	1,375	734	286
DG2, g	3,821	805	350
DG3, g	3,861	981	356

RESULTS AND DISCUSSION

Table 2. Posterior means (SD) of **heritability**, genetic, and phenotypic correlations

Trait	DFI1	DFI2	DFI3
DFI1	0.14 (0.04)	0.20 (0.02)	-0.02 (0.03)
DFI2	0.88 (0.10)	0.13 (0.03)	0.15 (0.02)
DFI3	0.19 (0.16)	0.34 (0.14)	0.16 (0.03)
Trait	**DG1**	**DG2**	**DG3**
DG1	0.12 (0.06)	0.15 (0.03)	0.05 (0.03)
DG2	0.70 (0.17)	0.10 (0.03)	0.14 (0.02)
DG3	0.45 (0.25)	0.63 (0.16)	0.08 (0.02)

Table 3. Posterior means (SD) of genetic correlations

Trait	DG1	DG2	DG3
DFI1	0.49 (0.19)	0.83 (0.09)	0.52 (0.15)
DFI2	0.48 (0.20)	0.67 (0.02)	0.24 (0.19)
DFI3	-0.29 (0.24)	-0.30 (0.16)	-0.37 (0.18)

Heritabilities for DFI and DG were lower compared with literatures using an average over the period (Hoque et al., 2007; Schulze et al., 2002). The genetic correlations especially between the second and the third periods for DFI and DG were low. Also, the genetic correlations between any DG and DFI3 were all negative. Applicable estimates using bivariate analyses (one DF and one DG) were similar to those with the six trait analysis. Negative genetic correlations may indicate compensatory growth, competition among animals, or the data structure of few animals with records in periods 1 and 3.

CONCLUSION

Data from automatic feeder stations can be analyzed using weekly averages. DFI and DG in extreme periods should be considered as different traits. Data for DG may require extensive editing. Special attention should paid to steps resulting in more accurate measurements of weight and in having all animals tested at similar days in life.

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