ESTIMATES OF GENETIC AND PHENOTYPIC PARAMETERS OF PERFORMANCE TRAITS FROM CENTRALLY TESTED BRITISH LANDRACE BOARS UNDER TROPICAL CONDITIONS IN ZIMBABWE

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SUMMARY

Data from centrally tested boars over a 6-year period were analysed. Animals were performance tested from 35-86 kg on a restricted feeding system. The traits analysed were daily gain (DG) g, food conversion ratio (FCR) and ultrasonic k backfat (BF) mm. Estimates of heritabilities, phenotypic and genetic correlations were obtained from a paternal half-sib analysis. The estimated heritabilities for DG, FCR and BF were 0.34, 0.20 and 0.37, respectively. The estimated correlations between the traits are in agreement with correlations reported in literature for traits measured in pigs on restricted feeding.

INTRODUCTION

Improved exotic pig breeds are used in many developing countries to produce pig meat under different production systems. In many such countries, British Landrace is used widely as a dam breed for producing crossbred sows to produce slaughter progeny (Sutherland et. al., 1985; Pathiraja, 1987). In most developing countries, there are no genetic improvement programmes for exotic pigs, and further improvement of existing stocks are based on regular importation of semen or boars from developed countries. These importations may not give the expected results because of possible genotype x environment interactions (Webb and Curran, 1984). Therefore, genetic improvement of adapted exotic breeds has to be carried out under existing environmental conditions in developing countries (Pathiraja, 1987).

However, the appropriate genetic parameters required to design suitable improvement programmes are not readily available for exotic breeds. For improved exotic breeds, genetic parameters obtained in their native environments may differ from those in environments in developing countries. Therefore, the purpose of this study was to investigate the environmental effects on performance test and to estimate genetic parameters under tropical conditions in Zimbabwe.

MATERIALS AND METHODS

The data used in this study was obtained from the central test station run by the Pig Industry Board. The data included 1560 centrally tested boars over the 6-year period 1983-1988. These were progeny of 147 sires. The traits analysed were daily gain (DG) g, food conversion ratio (FCR) and ultrasonic k backfat (BF) mm. Boars were performance tested in individual pens on a restricted feeding scale. For all traits the environmental effects considered were season, year and partial regression on age at start of the test (AOT). The season according to month at start of performance test was classified as cold (April-June), dry (July-September), early summer (October-December) or late summer (January-March). From a preliminary analysis it was concluded that the effect of season and partial regression on AOT were not significant (P 0.05) on BF. All analyses were performed using LSML76 (Harvey, 1977). For each trait, variance components were estimated by 'Henderson's Method 3' as programmed by Harvey (1977). For each trait, the following hierachical model was used.

$$Y_{ijk} = U + F_i + S_j + D_{kj} + E_{ijk}$$

where U = the overall mean; F_i = the i^{th} combination of fixed effects as appropriate; S_j = the random effect of the j^{th} sire; D_{kj} = the random effect of k^{th} dam nested within sires; E_{ijk} = random error. Both sire and dam components were assumed to contain one quarter of the additive genetic variance. Heritabilities (h^2), common environmental and genetic correlations were estimated from the sire components of variance and covariance using LSML76 (Harvey, 1977) as described by Merks (1987).

RESULTS

Means and standard deviations of the performance traits are shown in table 1 together with residual standard deviations and heritability estimates. DG and FCR were significantly (P 0.01) affected by year and season effects. BF was significantly (P 0.01) affected by year effect. The significant regressions of DG on AOT was negative, showing that older animals at start of the test grew more slowly while on test, but regression of FCR on AOT was positive, thus older animals at the start of the test had poorer FCR. Phenotypic and genetic correlations between the traits are shown in table 2. The estimated environmental correlations for the traits analysed on the boar littermates are given in table 3.

Table 1. Means, standard deviations, residual standard deviations and heritabilities for performance traits.

	Mean	s.d	Residual s.d	h^2	s.e
Daily gain	779	83.2	55.3	0.34	0.06
Food Conversion ratio	2.61	0.24	0.2	0.20	0.05
Backfat	17.79	2.02	1.78	0.37	0.09

Table 2. Estimated phenotypic (above the diagonal) and genetic (below the diagonal) correlations and their standard errors for traits measured on boars.

	DG	FCR	BF
DG	-	-0.63 ± 0.05	0.02 ± 0.9
FCR	-0.34 ± 0.18	-	0.15 ± 0.03
BF	-0.20 ± 0.08	0.32 ± 0.11	-

Table 3. Estimated common environmental correlations with their standard errors for traits measured on at least two littermates.

DG-FCR	-0.67 ± 0.08
DG-BF	0.10 ± 0.08
BF-FCR	-0.06 ± 0.02

DISCUSSION

All heritability estimates were moderate to large, and are in agreement with the results in literature for pigs on a restricted diet (Bampton et. al., 1977; Merks, 1987). The estimated genetic correlations between DG and FCR is in agreement with correlations reported in literature (Merks, 1987). This study also showed that under restricted feeding the genetic correlation between BF and DG was negative (-0.20) (McPhee et. al., 1988). Although the data set is relatively small, it may be concluded that genetic parameters for DG, FCR and BF for boars under tropical conditions are quite similar to estimates obtained under temperate conditions. In most developing countries, including Zimbabwe, commercial pig production is based on ad-libitum feeding. Therefore there is a need to have genetic parameters estimated on ad-libitum feeding under tropical conditions, in order to obtain maximum genetic progress.

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