GROWTH PERFORMANCE IN VIETNAMESE PIGS

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SUMMARY

One of the most important production traits in swine is growth rate. To improve this trait, test daily gain (TDG) is to be considered in this study for both native breeds: Mong Cai (MC) and Thuoc Nhieu (TN) and exotic breeds: Large White (LW), Landrace (LR) and Duroc (DR). TDG of MC, TN, LW, LR and DR breeds were 0.30, 0.44, 0.53, 0.53 and 0.56 kg/day. First, back and three-breed crosses between LW, LR and MC perform adequately for meat production (0.46, 0.50 and 0.53 kg/day) in Northern Vietnam, even under poor rearing conditions, where it is hot and humid and food is not sufficient in quantity and bad in quality. F1, backcrosses and three-breed crosses between DR and other exotic breeds had high TDG (0.60, 0.58 and 0.61 kg/day), indicated that pigs sired by DR were faster growing than pigs sired by LW or LR. In addition, female pigs grew significantly lower (0.52 kg/day) than castrated males (0.56 kg/day) ($p < 0.01$). Herd*year*season of starting test period (Hd*Yt*St) and breed influenced TDG. The estimates of heritability for TDG in TN, MC, LW, LR and DR breeds were consistently high, at 0.50, 0.51, 0.30, 0.47 and 0.44. The heterosis for TDG in first crosses and three-breed crosses of MC or DR were higher than those in backcrosses and DR crosses had lower heterosis than MC crosses.

Keywords: Growth rate, pigs, heritability, heterosis

INTRODUCTION

The economic impact of improving daily gain is one of diminishing costs per fattening pig. When growth is higher, pigs will take fewer days to reach market weight, thus total maintenance requirements, costs for labor and housing per pig are reduced. Moreover, test daily gain (TDG) may be the best amongst pig production traits to study in Vietnam situation due to its easier, more accurate and cheaper for data recording. Therefore, amongst pig production traits, TDG is the most important factor and it is the most important variable key in the productivity function in the pig industry, enhance influencing profitability of the pig enterprises.

MATERIALS AND METHODS

Characterisation of data. A total of 7,128 records were collected from 11 Vietnamese breed genotypes with 3 exotic breeds: Large White (LW), Landrace (LR) and Duroc (DR), 2 native breeds: Mong Cai (MC) and Thuoc Nhieu (TN), 3 MC crosses: LWxMC or LRxMC, LWxLWMC or LRxLRMC and LRxLWMC or LWxLRMC and 3 DR crosses: DRxLR or DRxLW, DRxDRLR or DRxDRLW and DRxLWLR or DRxLRLW over 9 years (1990-1998), from 22 herds and 2 seasons per year (May-Oct and Nov-Apr.). Test daily gain (TDG) was calculated as total weight gain during the test period divided by the total number of pig days on test, from 70 to 180 days of age for exotic, to 210 days for cross pigs and to 240 days for native breeds.

Statistical analysis. Fixed effects were analysed using the SAS, PROC GLM procedure (SAS 1993). Heritabilities are estimated using a Derivative - Free Restricted Maximum Likelihood (DFREML) procedure using an animal model through univariate analyses (Meyer 1993). Heterosis percentages of TDG in different crosses of MC and DR based on the means of the crossbred offspring and pure parents were estimated after Sellier (1976).

Models for analyses of test daily gain. Herd*year*season of starting test period (Hd*Yt*St) and sex were used as fixed effects. Age at end of test was fitted as a linear covariable (Age). Results are presented in Table 1. These fixed effects explained 50-66% of the variation. Sex was not significant in the TN and MC breeds. The reason for this may be that both sexes of TN and MC develop at the same rate and live weights are not different at the same age. The effect of ending age of the test period explained about 6, 7, 4, 3 and 6% of the total variation in TN, MC, LW, LR and DR breed genotypes, respectively.

Table 1. Number of records, proportion of phenotypic variation explained by fixed effects (r^2) and significance level of individual effects for TDG

Breed genotype	Record	r^2	Hd*Yt*St	Sex	Age
TN	394	0.65	**	ns	**
MC	678	0.61	***	ns	**
LW	1,724	0.50	***	***	***
LR	902	0.60	***	**	***
DR	661	0.64	***	**	***

RESULTS AND DISCUSSION

The performance of TDG. Although the production potential of indigenous breeds is low, they are well adapted to the different production systems in Vietnam. In many situations, such as rural or mountain areas of Vietnam, indigenous genotypes may in fact be the most suitable. TDG of native breeds were low, at 0.30 kg/day in MC and 0.44 in TN pigs. Low TDG in Vietnamese native breeds could be the result of lower genetic potential for growth rate of native breeds. The TDG finding in this study for MC breed was higher than those of 188-230 (Doanh 1994), indicating that selection and environmental conditions to be better during last few years.

A simple upgrading method has been utilised in Vietnam to replace the indigenous population with superior genotypes, in order to improve growth rate. MC crosses perform adequately for meat production even under the stressful environment, where food is not sufficient, hot and humid. With 0.46 kg/day in first crosses is acceptable because of its profitability for rearing them. This estimate was slightly higher than the value of 0.44 kg/day, found in 194 F1(LWxMC or LRxMC) pigs (Duc *et al.* 1997). Particularly, in backcross and three-breed cross with MC, TDG (0.50-0.53 kg/day) has nearly reached the values of exotic breeds. This helps to explain why nowadays, nearly all commercial herds, where the conditions are not suitable for exotic breeds, MC crosses are dominating.

However, adapting exotic breeds has to be carried out to produce suitable high producing genotypes under existing management and feeding systems of Vietnam. Exotic breeds had low TDG, at 0.53 kg/day for both LW and LR, and 0.56 kg/day for DR. The reasons might be lack of selection or breed differences, poor nutrition and inbreeding depression. Furthermore, the pig has very little sweating capability and is unable to sweat to a degree that would be effective for thermoregulation under the stressful environment with high temperature and humidity. As a result feed intake will be decreased. However, they were far below the values of 1 025 g/day in 1,814 and 1,374 Germanian LW and LR boars (Von Felde *et al.* 1996).

First, backcross and three-breed cross of DR had high TDG, at 0.60,0.58 and 0.61 kg/day. This may be due to their heterosis and breed effect. These results were slightly lower than values of 0.69 kg/day on three-breed cross of DR for *ad libitum* feeding (Nghi *et al.* 1995). Crossbred DR pigs grew significantly faster and heavier at slaughter age than white purebred and crossbred without DR pigs. This conclusion is in agreement with the results found in an experiment of LR, LW and DR and their crosses of DR and without DR (Irgang *et al.* 1992). This helps to conclude that DR could be used as a terminal sire for meat production with pure LR or LW breeds and first cross of them in southern Vietnam.

MC crosses in Vietnam, particularly in northern areas, have contributed significantly to the total pig meat production. Each MC dam and MC cross dam mated with LR or LW boars, giving 1,377 and 1,410 kg/sow/year in North (Thien *et al.* 1990) and 1,456 and 1,788 kg/sow/year in South (Hai and Vien, 1991). To increase TDG, DR could be used in South Vietnam. However, in northern areas MC crosses might be used, especially in the mountain regions, where conditions are not good.

Heritability. The estimates of heritability for TDG in TN, MC, LW, LR and DR breed genotypes were consistently high, at 0.50, 0.51, 0.30, 0.47 and 0.44, respectively.

Estimates of heritability in LW was lower, at 0.29. This finding was higher than that of 0.25 found in pooled data set of three piggeries in southern Vietnam (Hai *et al.* 1997). Pre-selection of the sires in different herds is also influential to the genetic variation. This result could be also explained in that LW imported into Vietnam has been selected and are more homogenous than other breeds. LR and DR had heritabilities of 0.47 and 0.44.

Heterosis for TDG. The heterosis for TDG in first cross, backcross and three-breed cross of MC were 10.84, 5.82 and 12.17% (Table 2). However, heterosis levels for different production traits in DR crosses maintained in Vietnam were lower (8.60, 4.98 and 11.93%.) than those levels for MC crosses. The reason is that F1 and three-breed crosses have higher direct heterosis (100%) than backcrosses (50%). This might be also due to the shorter genetic distance between DR and LW or LR, compared with that between MC and LR or LW breeds. From these values, it might be concluded that to get high productivity in the pig industry, crossbreds may be more useful in slaughter stocks.

Table 2. Number of records, least squares means (kg/day) with standard deviations and heterosis for TDG in MC and DR cross pigs

Crossbred	Record	TDG	SD	Heterosis (%)
F1 of MC	324	0.46	0.06	10.84
Backcross of MC	397	0.50	0.09	5.82
Three-breed cross of MC	411	0.53	0.08	12.17
F1 of DR	365	0.60	0.10	8.60
Backcross of DR	469	0.58	0.10	4.98
Three-breed cross of DR	803	0.61	0.08	11.93

Due to the use of heterosis and high estimates of heritability in different breeds for TDG, results from different works in Vietnam have shown that, during last 2 decades the genetic progress for ADG during fattening period has amounted from 419 g/day in the year 1985 (Hai and Hien 1985), reached to 633-688 g/day in 1995, for three-breed cross of DR (Nghi *et al.* 1995). It could be concluded that to improve TDG in pig production, beside of crossbreeding, selection could be useful due to high heritability estimates, and it could be a important objective for pig breeding programs.

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