STUDIES ON SOME PRODUCTION AND CARCASS TRAITS OF MONG CAI AND THEIR CROSSES IN NORTH VIETNAM

N.V. Duc [1] B.P. Kinghorn [2] and H.-U. Graser [1]

[1] Animal Genetics and Breeding Unit (AGBU)*, UNE, Armidale, NSW, 2351.
[2] Department of Animal Science, UNE, Armidale, NSW 2351.

SUMMARY

A total of 1,879 pure Large White (LW) and Landrace (LR), 481 pure Mong Cai (MC), 194 F1, 70 backcross and 69 three-breed cross MC pigs from 5 herds in North Vietnam performance recorded between 1984 and 1995 were measured for average daily gain during the test period (TDG), backfat thickness (BF) and feed conversion ratio (FCR). The averages of TDG in LW and LR, MC, F1, backcross and three-breed cross pig groups were 0.52, 0.28, 0.44, 0.51 and 0.52 kg/day. The estimates of FCR were highest in pure MC (5.18), followed by F1 (4.13), backcross (3.73) and lowest in the three-breed group (3.67). The same trend was apparent for BF in the four groups, MC (36.45) > F1 (27.25) > backcross (23.97) > three-breed cross (23.71 mm) > pure LW and LR (20.95). Heterosis estimates were 10.00, 10.90 and 13.04% for ADG, -4.17, -3.89 and -5.51% for FCR and -5.05, -2.28 and -3.33% for BF in F1, backcross and three-breed groups, respectively. The three-breed crosses had more desirable TDG, FCR and BF performance than two-breed crosses and much better than purebreds. Pig production and carcass quality in rural areas of North Vietnam, where the conditions for the pig industry are not adequate for developing exotic breeds, may be increased by using three-breed crosses incorporating MC.

Keywords: Pigs, crossbreeding, growth rate, feed conversion ratio, backfat thickness

INTRODUCTION

Pork production is the most important among the Vietnamese animal industries, producing 938,000 tons per year. Pork accounts for about 75% of the total meat production in Vietnam (Cuc 1995). During the last 30 years, average of testing period daily gain (TDG, kg/day), feed conversion ratio (FCR, kg feed/kg gain), backfat thickness (BF, mm) and various indicators of lean meat percentage (LMP) have been selected for and are considered the most important traits in pig breeding. With increased awareness of the disadvantages of animal fat, the demand for lean meat is ever increasing and pig breeders have been forced to produce pigs with very lean carcasses or low BF. A number of published papers have shown the growth rate of the Mong Cai (MC) breed to be low, at 196 - 300 g/day (Doanh 1994), explaining that pig production in Vietnam, especially using native breeds, is far below the production in other countries. The aim of this paper is to study some production and carcass traits, particularly TDG, FCR and BF of MC and their crosses in north Vietnam.

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[1] Animal Genetics and Breeding Unit (AGBU)

Background information. MC is a popular and important native breed in Vietnam. It is very good in reproductive aspects as well as resistance to stressful environmental conditions. This native pig breed can be well developed in Vietnam, even where the conditions are not good. However, it has a small body size, low TDG, high FCR and high BF. It is widely farmed in mountain areas, where the conditions are not good for rearing exotic purebreds and exotic crosses. During the last 20-30 years, MC has been intensively used for crossing with exotic breeds in order to increase the lean meat percentage, TDG, and reduce FCR. In rural areas, MC and MC crosses have been widely farmed and these animals contribute a significant proportion to the total pig meat production in Vietnam.

MATERIALS AND METHODS

From 1984 to 1995 a total of 2720 pigs of pure Large White (LW) and Landrace (LR), MC, F1 LW x MC, LR x MC, backcross LR x (LR x MC), LW x (LW x MC) and three-breed crosses LWx (LR x MC), LR x (LW x MC) were recorded for TDG, FCR and BF across 5 herds in north Vietnam.

Statistical analysis. Fixed effects considered were herd-year-season (4 seasons) of test period, 4 breed genotype groups and sex. All these fixed effects were analysed by using the SAS procedure PROC GLM (SAS 1993) and they were highly significant for each trait ($p < 0.01$). The data were also analysed by using a Restricted Maximum Likelihood (REML) procedure applied to a univariate animal model (Meyer 1993).

RESULTS AND DISCUSSIONS

Performance of TDG, FCR and BF for MC and their crosses. MC crosses perform adequately for meat production even under poor conditions of pig husbandry in northern Vietnam, where the environment is not optimal, with food deficiencies and inefficient management. The least square means for TDG, FCR and BF of MC and MC crosses are presented in Table 1.

Table 1. Least square means and their standard errors for TDG, FCR and BF in MC and their crosses

Breed	Trait		
	TDG (kg/day)	FCR (kg/kg)	BF (mm)
MC	0.28 ± 0.01	5.18 ± 0.27	36.45 ± 0.25
LW and LR	0.52 ± 0.01	3.44 ± 0.22	20.95 ± 0.18
F1	0.44 ± 0.01	4.13 ± 0.28	27.25 ± 0.20
Backcrosses	0.51 ± 0.01	3.73 ± 0.31	23.97 ± 0.26
Three-breed crosses	0.52 ± 0.01	3.67 ± 0.32	23.71 ± 0.47

TDG increases from pure MC to F1, backcross and is highest in three-breed cross pigs. This value (0.52 kg/day) was higher than the estimated value of 0.36 (Vong *et al.* (1986). However, this value was slightly lower than the value of 0.55 kg/day for F1 (Landrace x MC) in the National Institute

of Animal Husbandry herd, where Landrace (LR) came from Belgium (Tuyen 1989). In three-breed groups, TDG was higher than that of 0.49 kg/day at the Binh Thang centre (Hai *et al.* 1990).

Estimates of FCR decrease from pure MC pigs to F1, back and three-breed cross pigs. These findings were lower than the estimates of 4.89 kg/kg (Hanh *et al.* 1991) and 4.4 kg/kg (Hai and Vien 1991). In contrast, our FCR estimate in the F1 group was higher than the values of 3.96 and 4.00 kg/kg (Tuyen 1989), from different F1 (LR x MC) herds, where LR came from Belgium and Japan, and 4.05 kg/kg found by (Vong *et al.* 1986) in another F1 genotype herd.

BF followed the same pattern as FCR, reducing from 36.45 mm in pure Mong Cai to 27.25 mm in the F1 group, to 22.97 mm in the backcross, and even lower in the three-breed groups (23.71 mm). The value of BF of MC in our study was close to the finding of 36.70 (Nhon and Hot 1977). The value for BF in F1 was lower than those reported by Hanh *et al.* (1991).

Heterosis in Mong Cai crosses. Most production and carcass traits can be improved by selection because their heritability is moderate to high. They may be further improved in crossbred animals due to the effects of heterosis. The benefit of heterosis is to produce pigs more efficiently for slaughter and this has been used effectively by numerous commercial producers for many years in Hanoi and HoChiMinh City, but not in the countryside areas of Vietnam. Crossbreeding between exotic and native breeds has been carried out for the last 30 years in some places in Vietnam in order to exploit heterosis (Thien *et al.* 1984). Nowadays, MC crossbred pigs are used in nearly all commercial herds in north Vietnam. Heterosis estimates for TDG, FCR and BF of Mong Cai crosses are presented in Table 2.

Heterosis for TDG in F1 and backcross groups was similar, but it was higher for the three-breed cross groups. This finding is lower than the estimates of 11.5% in crossbred progeny of Hampshire and LR (Baas *et al.* 1992), but higher than that of 5.48% in three-breed crosses between improved Chinese pigs and exotic breed sires (Jin and Mao 1994).

Heterosis for FCR of these three genotype groups ranged from -3.89 to -5.51%. This estimate was higher than the estimate of -2.5% in the crossbred dam Hampshire x LR (Baas *et al.* 1992). However, this was lower than the value of 9% which was found for two-breed crosses between improved Chinese pigs and exotic breeds (Jin and Mao 1994). In general, the hybrid animals have more desirable FCR than the purebreds. Our BF heterosis estimates are higher than the estimate of -0.9% in the crossbred dam Hampshire x LR (Baas *et al.* 1992). This table illustrates the hybrids had lower BF than their purebred counterparts. However, heterosis for carcass traits, for example BF was expected to be low (Serres 1992).

In conclusion, three-breed crosses, which are 25% MC, had better TDG, FCR and BF than F1 of MC and much better than pure MC. To increase pig production and carcass performance in rural areas of Northern Vietnam, where conditions for rearing exotic breeds are not adequate, the variation of temperatures is high together with high relative humidity, food quality is low and management is inefficient, three-breed crosses of MC, such as LR x (LW x MC) or LW x (LR x

MC) may be used. More detailed modelling studies are required to identify which crosses are most economically and logistically appropriate for each region.

Table 2. Heterosis (%) of TDG, FCR and BF of MC crosses

Breeds	TDG			FCR			BF		
	N	Mean	Heterosis	N	Mean	Heterosis	N	Mean	Heterosis
MC	481	0.28	0.00	481	5.18	0.00	426	36.45	0.00
LW and LR	1,879	0.52	0.00	1,362	3.44	0.00	1,879	20.95	0.00
F1	194	0.44	10.00	194	4.13	-4.17	194	27.25	-5.05
Backcrosses	70	0.51	10.90	70	3.73	-3.89	70	23.97	-2.28
Three-breed crosses	69	0.52	13.04	69	3.67	-5.51	69	23.71	-3.33

However, small herd size and low infrastructure in rural areas will make implementation a challenge. It seems that government and other agencies could play a most useful role in the development of parental seedstock, distribution of these parent animals, and provision of an advisory service. This would help to educate farmers and develop cooperatives for more efficient pig production exploiting the benefits of crossbreeding, some of which have been identified in this paper.

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