Non-genetic Factors For Pre-weaning Performance Of The Zimbabwean Mukota And Large White × Mukota Crossbred Pigs

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Introduction

In Zimbabwe, Mukota pigs play an important role in improving the economies of rural households. Mukota pigs have desirable attributes such as the ability to utilise fibrous diets and, parasite and heat tolerance and strong feet which make them suitable for free range, low-intensity management systems (Chimonyo, Dzama and Mapiye (2010)). However, currently, there are several threats to the production of the Mukota pig which include lack of information on its attributes, replacement of local breeds with exotics, unbalanced admixture through uncontrolled crossbreeding, unclear, non-existent or ill-defined policies and poverty and (Halimani, Muchadeyi, Chimonyo et al. (2010)). The lack of information on the attributes of the Mukota breed makes it difficult to conserve, utilise and incorporate it in improvement schemes (Chimonyo, Dzama and Bhebhe (2006)). The pre-weaning performance of Mukota pigs and its crossbreds under low-input production systems, for example, is not well known. To promote conservation and utilisation, the pig producer should be cognizant of the major sources of variation and their relative importance in affecting measures of pig performance. The objective of the study was to evaluate the pre-weaning performance of Mukota and Large White × Mukota piglets.

Materials and methods

Study site. Data on Mukota pigs were collected from the University of Zimbabwe Farm, Harare, Zimbabwe. Mukota pigs were collected from Mutoko, Mvuma and Mount Darwin communal areas in Zimbabwe. This was done to increase diversity and reduce inbreeding in the base population. Large White boars used for crossbreeding with Mukota sows were obtained from the Pig Industry Board Farm (PIB), Arcturus, Zimbabwe.

Management of pigs. Matings were done through natural service. Sows were culled after the eighth parity. Animals with an inbreeding coefficient of above five percent were not mated to each other. Gilt replacements were selected on a within-litter basis. Replacement gilts had above average daily gains, strong legs and no up-turned vulvas. All gilts selected had at least 12 teats. Selection of Mukota boars was also practised at the University of Zimbabwe Farm. Boars were selected based on body confirmation and shape. Pedigree records were also used in boar selection to reduce inbreeding. All the pigs that were not selected for breeding were put on the commercial unit and monitored for growth performance until they reach market weight. All dry sows and boars were fed on a diet that contained 25 % maize cob meal (13 % CP and 9.6 MJ ME/kg). Lactating sows were fed 2 kg of commercial brood sow meal a day (16 % CP and 12.2 MJ ME/kg) and an allowance of 0.5 kg for each piglet that it was nursing for five weeks. Feeding was done twice daily; at 0630 and 1500 h.

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The piglets depended on their mother's milk and the dry feeds for growth after day 21. Drinking water was supplied *ad libitum*. Body condition at farrowing and weaning were 2 and 3, respectively. Piglets were weaned at 35 days (± 4 days). All piglets were ear notched at birth for identification.

Data and traits analysed. Data were collected between January 1998 and August 2003. A total of 431 litters, 350 from Mukota and 81 from Large White × Mukota crossbred piglets were evaluated. This comprised of 2467 and 640 individual pig records of each of Mukota and Large White × Mukota crossbred piglets, respectively. Litter traits recorded were pre-weaning mortality, the total and average litter sizes and litter weights at birth, day 21 and 35, average daily gain from birth to day 21, day 21 to day 35 and birth to weaning.

Statistical analyses. All traits were analysed using the PROC MIXED procedures (SAS, 2003). The effects of genotype of sire, parity of sow, month of farrowing and sex of piglet on litter sizes, weights, growth rates and mortality of piglets were incorporated into the linear model for repeated measures. Sow was included as random effect. PDIFF option was used for mean separation.

Results and discussion

Table 1 shows summary statistics for the litter sizes, weights, growth rates and mortalities of piglets. Genotype of sire and parity of sow did not affect litter sizes. Litters that were farrowed during the cold months (May, June, July and August) had the lowest litter sizes at weaning. Generally, average daily gain (Figure 1A) and litter weight from birth to day 21 (Figure 1B), and total litter weight (Figure 1C) and average litter weight at weaning (Figure 1D) were low during the cold months. It is generally expected that litter sizes at weaning and body weights should be low during the cold months (Gordon (1997)). In addition, pigs are expected to expend a lot of heat during the cold months to keep them warm. In general, crossbred piglets gained body weight faster ($P < 0.05$) than Mukota piglets up to three weeks of age (Table 2). The observation was unexpected and is difficult to explain. This finding could suggest that it is a trait of economic importance in the genetic evaluation of pigs. Pigs three week performance is closely associated with the development of acquired immunity in piglets (Gordon (1997)). Weak piglets are not only susceptible to disease and crushing, but are also less competitive during feeding than their stronger counterparts. Performance at this stage is, thus crucial to the overall growth of pig and the resistance to diseases prevalent in a particular environment. Such information is vital in designing and evaluating crossbreeding schemes involving the local genotypes.

The daily gain from day 21 to 35 and gain from birth to weaning was not significantly influenced by sex, parity and genotype of sire. The growth rates before weaning obtained in this study revealed that Mukota piglets have rapid early growth but, perhaps, slow late growth rates. The observation that growth rate before three weeks of age was lower than growth rate after the third week suggests that these two phases could be treated as different traits in genetic evaluations. These results indicate that the Mukota increase rate of growth with age, but the growth rate reaches the plateau early. This could partly explain the ability of piglets to withstand and survive draughts under extensive production systems. At advanced parities, crossbred piglets had lower ($P < 0.05$) total and average litter weights at weaning than Mukota piglets (Table 3). The observed differences could be related to age of the sow, the uterine capacity, milk production by the sow and the ability to utilise fibrous diets (Chimonyo, Dzama, and Bhebhe (2006)). These results could mean that Mukota pigs are also suitable for medium-input production systems, since they have comparably higher total and average litter weights at weaning than crossbreds when both are fed fibrous diets.

Table 1: Summary statistics for the piglet litter sizes, weights, growth rates and mortalities

Trait	Sample size	Mean	Standard deviation	Minimum	Maximum
LSBR	434	7.1	2.29	1.0	12.0
LS21	433	6.45	2.85	3.0	12.0
LSW	433	6.20	2.56	1.0	11.0
ALBW (kg)	433	0.8	0.23	0.4	1.5
LWW (kg)	433	36.15	16.52	7.4	81.0
ADG21 (kg/day)	3107	0.13	0.45	0.0	0.2
ADGWW (kg/day)	3107	0.17	0.86	0.1	0.3
ADG21-35 (kg)	3107	0.22	0.12	0.2	0.3
AVWWT (kg)	433	5.86	1.38	2.7	9.0
PREWM (%)	433	9.57	1.55	0.00	0.65

Litter size at birth (LSB); Litter size at day 21 (LS21); Litter size at weaning (LSW); average litter weight at birth (ALBW); litter weight at weaning (LWW); average weight at weaning (AVWWT); average daily gain from birth to day 21 (ADG21); daily gain from day 21 to day 35 (ADG21-35); gain from birth to weaning (ADGWW); pre-weaning mortality (PREWM) in piglets.

Table 2: Least square means (± standard error) of body weight gain (kg/day) from birth to day 21 (ADG21) and litter weight (kg) at day 21(LW21) based on sex and genotype of sire

Genotype of sire	N	Sex	ADG21	LW21
Mukota	1237	Male	0.11 ± 0.026^{a}	2.34 ± 0.256^{b}
Mukota	1230	Female	0.10 ± 0.029^{a}	2.14 ± 0.215^{a}
Large White	340	Male	0.15 ± 0.045^{b}	3.20 ± 0.245^{c}
Large White	300	Female	0.14 ± 0.041^{b}	2.91 ± 0.262^{c}

^{abc} Values with different superscripts within column are different ($P < 0.05$).

Table 3: Least square means (± standard error) of litter weight (kg) at weaning and average weight (kg) at weaning based on parity and breed of sire

		Total weight at weaning			Average weight at weaning	
Parity	N	Mukota	N	Large White	Mukota	Large White
1	36	27.6 ± 3.39^{a}	16	24.0 ± 3.43^{a}	5.1 ± 0.36^{a}	4.8 ± 0.38^{a}
2	48	32.1 ± 3.31^{a}	15	24.2 ± 3.43^{a}	5.6 ± 0.38^{a}	4.9 ± 0.38^{a}
3	43	27.6 ± 3.39^{a}	13	31.1 ± 4.19^{b}	5.7 ± 0.38^{ab}	5.1 ± 0.41^{a}
4	44	32.1 ± 3.31^{a}	10	34.1 ± 3.43^{b}	6.0 ± 0.33^{b}	5.2 ± 0.33^{a}
5	46	36.7 ± 3.39^{b}	12	34.7 ± 4.14^{b}	6.0 ± 0.33^{b}	5.4 ± 0.42^{a}
6	43	38.9 ± 3.39^{b}	13	38.7 ± 4.19^{b}	6.2 ± 0.33^{b}	5.7 ± 0.41^{ab}
7	48	39.6 ± 3.21^{b}	13	39.8 ± 4.19^{b}	6.3 ± 0.40^{bc}	5.7 ± 0.34^{ab}
8	38	56.3 ± 3.32^{d}	12	44.7 ± 4.15^{c}	8.3 ± 0.36^{d}	6.6 ± 0.34^{c}

^{abc} Values with different superscripts across rows and columns for a particular trait are different ($P < 0.05$).

Genotype of sire did not influence mortality from birth to weaning. The similarity in the mortalities between the two pig genotypes could suggest that the crossbred piglets can also be raised under low-level management conditions. Mortality rates increased up to the fifth parity and then tended to drop as parity increased. Most piglets died in the colder months of the year. These findings emphasise the notion that cold stress tends to be more influential in

piglet performance than heat stress, as is normally the case in European and American production systems (Gordon (1997)).

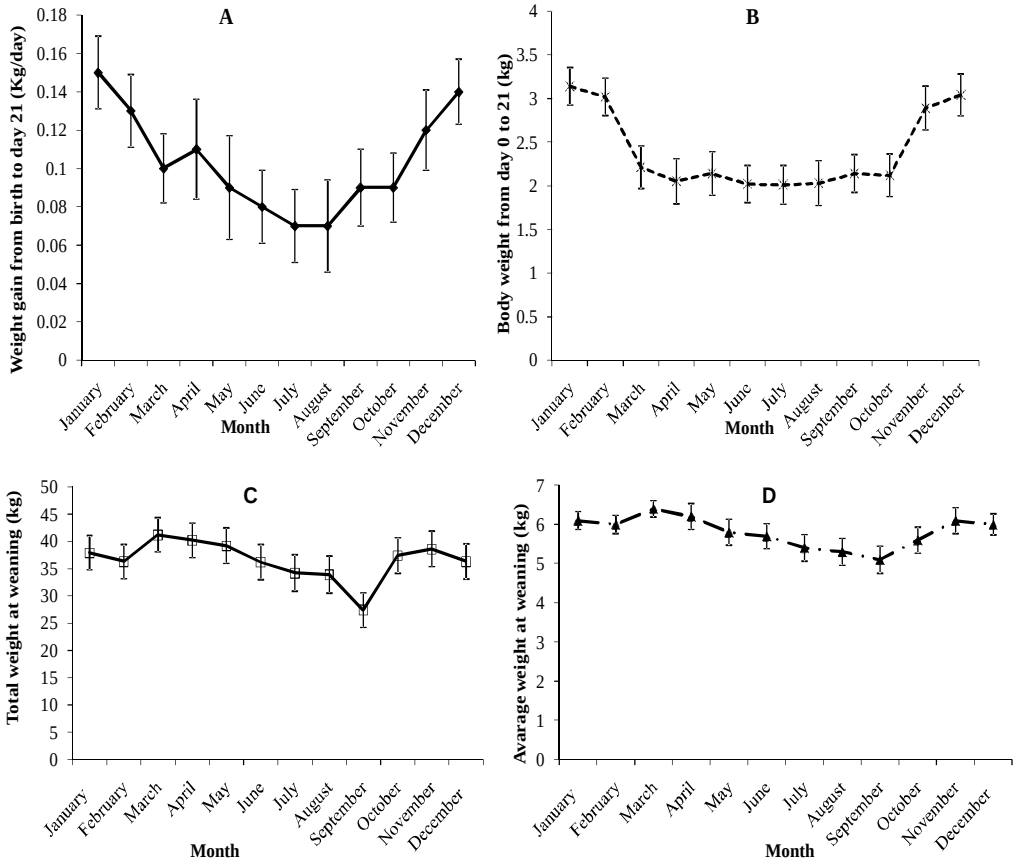

Figure 1: Least square means (± standard error) of body weight gain from birth to day 21 (A) and body weight at day 21 (B), total weight at weaning (C) and average weight at weaning (D) based on month of farrowing

Conclusion

It was concluded that since Mukota piglets had higher litter weights at weaning than crossbreds, they could be suitable for both low and medium input production systems. To increase utilisation of indigenous pig genetic resources for benefit of rural people, evaluation of post-weaning and adaptability traits in Mukota pigs is important.

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