Nigerian local pigs

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Evaluation of the F1 and backcrosses of Nigerian local pigs and the Large White for litter characteristics in Southwest Nigeria

Investigation of the effect of pig genotype on litter performance under the humid tropical conditions of Southwestern Nigeria.

Abstract

Introduction

Materials and method

Management

The breeding stocks included purebred Nigerian local pigs (NP) and the Large White (LW). These stocks were maintained routinely at the University Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, Nigeria, for teaching and research purposes. The animals were grouped into pens according to breed, sex and physiological status (pregnant, suckling, growers, finishers). Each pen was provided with feeder and water troughs. The husbandry system was intensive, but animals were occasionally allowed on pasture. The open pasture areas were also provided with water and feeder troughs, a wallow, and surrounded by trees to provide shade to the animals. Table 1 shows the mating scheme for the purebred, F1 and backcrosses.

Boars were introduced to sows and mature gilts on heat. Standard management practices were followed through mating, gestation and weaning. Pregnant sows were fed about 2.0 kg of a gestation diet (about 20% crude protein) daily. As the projected parturition date approached, sows were taken to farrowing pens that had been cleaned and disinfected. After farrowing, data were recorded on litter size and weight at birth - number dead and number alive were noted. As from two weeks of age, piglets were fed a commercial creep feed ad libitum until weaning at 42 d. It is to be noted that the quality and availability of the diets as well as the overall management of the unit could have fluctuated over the years.

Data collection and analysis

Data were routinely recorded on the following: age and weight of sow at farrowing, litter sizes and weights at farrowing and at weaning, number live and dead at birth and at weaning, sow and boar of litter. These data were copied from the Master file at the University Swine Unit and transferred to a Personal Computer Swine database. The entire datasets spanned a period of 12 years (1979-1990).

Data were subjected to analysis of variance for unequal sub-class numbers, using the following model:

$Yijkl = \mu + Gi + Sj + Xk + (GS)ij + Eijkl$

Data were analyzed using the General Linear Model procedure of SAS (1999). Means for each variable effect were compared using the least squares means options of the same procedure. Preliminary analysis showed that the year of farrowing effect was not significant . This effect was therefore excluded from the final model.

Results

The reasons for the re-ranking for these two genetic groups are not clear-cut but may be related to some adaptability features of the LW breed which could have affected its ability to adjust to environmental changes associated with different seasons. In contrast, the NP×NP and backcrosses ((NP×LW)×LW and NP×LW)×NP) did not show differences or re-ranking in performance between seasons. In particular, the NP×NP genetic group, according to Igboeli and Orji (1980), possesses greater heat tolerance and is thus able to display some stability in performance across different seasons when compared to the LW×LW and other genetic groups.

Genetic group and season of farrowing had marked effects on litter birth weight (LBWT) (Table 3). Litters from the LW×LW matings recorded the heaviest LBWT, followed by the (NP×LW) ×LW, while litters from the NP×LW and (NP×LW) ×NP were similar ($P>0.05$) and heavier than litters from the NP×NP group ($P<0.05$). This observed trend in LBWT could be due to the large size of LW sows and boars - about twice the size of the NP (Adebambo and Dettmers 1979). Significant differences between pig genotypes in LBWT have been reported by several studies (Johnson 1980; Adebambo 1983; Kuhlers et al 1988).

The same trend described above for LSF was reflected in the least squares means for litter size at weaning (LSW) (Table 4). LSW ranged between 1 and 9 weaners with an overall mean of 7.12. The highest LSW was recorded by the NP×LW and (NP×LW)×LW. Such superior performance could be attributed to heterotic effect resulting from crossbreeding. Several authors (Adebambo 1983, Gaughler et al 1984; Kuhlers et al 1988) have reported highly significant differences between purebred and crossbred genetic groups of pigs in litter traits at farrowing and at weaning. Litter size at weaning is a function of LSF and the rate of pre-weaning mortality. In the present study, it was observed that the genetic groups that recorded large LSF also maintained that superiority up to weaning. This development could be attributed to the following reason(s): (a) greater liveability on the part of the crossbred NP×LW litters due to hybrid vigour and (b) improved maternal ability on the part of the crossbred NP×LW sows mated to LW boars. These reports further justify the main incentive for the wide use of crossbreeding in commercial swine production, which is due primarily to the exploitation of hybrid vigour and improved maternal performance of crossbred sows (Bereskin 1983; Pathiraja and Oyedipe 1990; Falconer and Mackay 1996).

5.58±0.14c	89	5.47±0.14 g	21 1	5.53±0.11 k

6.91±0.29b	72	7.21±0.37f	150	7.10±0.23j
8.12±0.60*a	73	7.27±0.46*f	153	7.70±0.38i
8.00±0.65a	65	8.08±0.62e	151	8.04±0.45i
7.14±0.54b	68	7.29±0.14f	158	7.22±0.35j
7.15±0.40	367	7.06±0.37	823	7.12±0.31

Table 5 shows the least squares means of litter weaning weight (LWWT) in two farrowing seasons. The heaviest litters at weaning were recorded by the LW×LW genetic group, followed by the (NP×LW)×LW group, while the LWWT for the NP×LW and the (NP×LW)×NP) were similar (P> 0.05). This trend could be attributed to large LSW since both traits (LSW and LWWT) are highly positively correlated (Khalil et al 1986). The observed differences between genetic groups in LWWT are also due to dissimilarities in body weights and sizes of the original parental breeds. Genetic group of litter and season had a marked effect on this trait, in agreement with McLaren et al (1987), and Kuhlers et al (1989).

Litters from (NP×LW)×LW displayed the highest viability at 6 weeks (Table 6). This genetic group showed 13.8% and 8.00% higher liveability at 42 d than litters from purebred NP×NP and LW×LW respectively. This result may indicate some inherent advantages (e.g. improved viability) in the crosses derived from (NP×LW)×LW which essentially is 75% LW and 25 % NP. The performances of (NP×LW)×NP and NP×LW were similar and higher than the LW×LW purebred. The lowest pre-weaning survival rate (85%) was recorded by the NP purebred group, which agrees with the upper limit of 85% pre-weaning survival rate for Nigerian indigenous sows raised under intensive management (Pathiraja and Oyedipe 1990). The pre-weaning survival rate of 90% recorded for the LW×LW is however, higher than the value of 84% reported by Agbagha et al (2001) in South-eastern Nigeria.

Survival rate to weaning, as affected by the proportion of genes contributed by NP or the LW is shown in Figure 1. This figure indicated that all crossbred litters showed some advantages over the purebred LW, which was superior to the NP. The figure further reveals that the highest pre-weaning survival rate was recorded at the inclusion of 75% LW to 25% NP (or NP×LW sows backcrossed to LW boars).

According to Falconer and Mackay (1996), such superior performance of backcrosses could be due partly to hybrid vigour of the crossbred sows and partly due to the additive effect of the sire line. Reports from other studies (Fahmy et al 1978; Adebambo 1983; Kuhlers et al 1988) showed that pre-weaning survival rate differed significantly among breeds and crosses, indicating that this trait is largely influenced by the breed of sire (boar) and the type of dam (purebred or crossbred sow). However, contrary to the reports of Steinbach (1971) and Adebambo (1986) that the NP×NP litters were superior in pre-weaning viability, our study showed that the F1 crosses and the backcrosses involving the NP and LW showed superior pre-weaning survival rate. Such disparities between reports could be due to the manifestation of wide variations in performance traits within the populations of NP evaluated in all these studies, the present study inclusive. According to Pathiraja and Oyedipe (1990), the NP has been reported to display wide differences in performance traits across different ecological zones in Nigeria. These authors noted that among different populations of NP, LSW ranged from 0 to 8 weaners while pre-weaning survival rate ranged from 65% to 85%. These observations further strengthen the desirability to upgrade the NP through appropriate within breed selection and mating systems.

Final recommendations on the suitability or otherwise, of any genetic group should consider other measures of performance evaluation, including fertility levels in different seasons, average daily gain and feed efficiency (Schneider et al 1982). In addition, other breeds (Duroc, Hampshire) and breed combinations need to be evaluated for performance traits in order to determine their comparative advantages for profitable pork production in Southwest Nigeria.

Conclusion

This study showed significant genetic group effect on prolificacy and piglet viability to weaning. The F1 and backcross involving the (NP×LW) sows mated to LW showed the most superior performance in terms of highest liveability to weaning.

Further cross-breeding studies involving other breeds (Hampshire, Landrace) under different management systems should be conducted so as to determine the most suitable breed combinations for pig meat production under humid tropical conditions of Southwestern Nigeria.

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