

COMPARATIVE GROWTH AND CARCASS PERFORMANCE OF PROGENIES Sired BY PUREBRED LARGE WHITE AND HAMPSHIRE BOARS AND THEIR CROSSES WITH THE NIGERIAN LOCAL BREED

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ABSTRACT

THE performance of progenies sired by purebred Large White and Hampshire boars and their crosses with Nigerian local breed — the Large White × Local and Hampshire × Local boars was compared from birth to slaughter at 60kg liveweight using 4 boards each of the different breeds and crosses. 4 boars from each of 16 litters sired per breed comprising 4 dams mated per sire were evaluated.

Feeding was twice daily up to a maximum of 2.00kg meal per day.

Among the boar genotypes, significant differences in performance between progeny was found for the backfat thickness ($P = 0.01$). Carcass length and average daily gain ($P = 0.05$).

The progenies of the Hampshire boar were 0.61kg heavier than those of the crossbred boar at birth, had higher weaning weight (2kg heavier) and a significantly different ($P = 0.05$) average daily gain to slaughter. The progenies of purebred boars were 4.04 and 6.89 days earlier to slaughter, had 1.4 and 1.5% higher carcass yield but 1.9 — 3.44mm higher back-fat than the progenies from corresponding crossbred boars.

Significant breed differences were noted in the prime cuts of the carcasses.

INTRODUCTION

Crossbreeding for market production of fresh pork have been advocated for some time as a means of capitalizing on hybrid vigour. The use of crossbred boars which is being widely accepted in commercial swine production, (Fredeen, 1957; Swith and Lishman, 1976. Holtman *et al.*, 1976; Nelson and Robinson, 1976; Young *et al.*, 1976; Potapov and Astakova, 1977; Lishman and Smith, 1979) indicates that progenies of crossbred or hybrid males may not produce slaughter generations with less satisfactory carcass for fresh pork market.

Although several crossbred boars had been examined for market performance

of their offspring the indigenous pigs of Nigerian are still undergoing systematic evaluation.

Crossbreeding programme to upgrade the local breed with the exotic in order to exploit growth and carcass potential of the exotic breeds was started at the Institute of Agricultural Research and Training pig herd in 1978; this study is therefore one in the series of experiments to evaluate the performance of the local pigs of Nigeria.

Procedure

The breeding stock used consisted of Large White and Hampshire boars as purebred sires, the parent stock of which had been imported into this herd as far back as 1974 and were considered adapted to the environment. Crosses of these with the Local sows to produce F_1 offspring were embarked upon in 1978. The Local pigs are the unimproved pigs reared along the coast of West Africa and are characterized by their low growth potential and poor carcass characteristics. Phenotypic characteristics of some of the parents and progenies from the crosses had been reported (Adebambo and Dettmers, 1979). Selected F_1 boars from these matings were therefore used in further crossing with Large White dams, evaluation of the progenies was then carried out.

Pigs used in this trial comprised 4 boars taken from each of the 4 litters sired by each of the 4 boar types. Each sire breed was presented by 4 boars and the breeding female were large White sows.

These animals which were housed in

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groups by sire breed, were fed on a 20% crude protein commercial diet from 2 weeks of age at the rate of 0.25kg per piglet per day and changed to a 16 crude protein commercial diet at 10 weeks of age to a maximum of 2kg per head per day at slaughter. Weaning was done at 42 days of age. They were reared on concrete floor and watered ad libitum. The animals were weighed weekly from birth to slaughter. Measurements on the hot carcass were taken within 1 hour of slaughter and cold measurements were taken after the carcass had been chilled overnight at -5°C .

Measurements in the hot carcass included the fat depth on the last rib (P^2), the muscle depth below this fat and the carcass length.

Measurements on the chilled carcass included the joints i.e. ham, shoulder, belly cuts of the left side dissected according to methods of Cuthbertson (1968). Percent lean and fat content were determined by the coring device and calculated using the formula of Lu *et al.*, (1958).

Statistical analysis was the nested design randomized according to the procedure outlined by Snedecor and Cochran (1971) with the main effect being the genotype of sire.

$$\text{Model used} = Y_{ijk} = U + a_i + b_j + (a \ b)_{ij} + e_{ijk}$$

Where U is the general mean

a_i is the effect of the i-th sire

b_j is the effect of the j-th dam

$(a \ b)_{ij}$ is the interaction effect

and e_{ijk} is associated with ijk-th observation.

With no significant effect between dam lines, differences between sire progenies were tested by Duncan's Multiple Range Test to determine significance of means. Least square estimates were computed for each group mean according to procedure of Searle (1971) with breed of sire effect expressed as deviation from Large White or Hampshire boards.

RESULTS

The performance data of pigs used in this study are presented in Table 1. The feed consumption and daily gain were computed from the pen means (Table 2).

Significant genotypic differences were recorded for the number of pigs born per litter and pigs weight at weaning ($P < 0.05$). The Hampshire boar sired more pigs per litter (approximately 1 pig extra) which were about 2kg heavier at weaning.

TABLE 1:
Mean Performance data of Progenies

Breed of Sire	Hamp.	Lw.	Hamp.xLoc.	LW.xLoc.	Approx. of Mean
Breed of dam	Lw.	Lw.	Lw.	Lw.	
Number of Litters	16	16	16	16	
Average number of piglets born per litter	9.86 ^a	8.78 ^{ac}	8.91 ^{ab}	8.85 ^{bc}	0.32
Average number born dead	0.6	0.5	0.00	0.10	0.51
Average number weaned at 42 days	8.87	8.65	8.91	8.79	0.19
Average piglet weight at birth (kg)	1.95	1.55	1.35	1.33	0.58
at weaning (kg)	12.45 ^a	11.85 ^a	10.80 ^b	10.24 ^b	0.51*
Hamp. = Hampshire		Loc = Local		LW. = LargeWhite	

* $P < 0.05$
a, b, c = Means with similar superscripts on the same.
horizontal lines are not significantly different.

TABLE 2:
Post Weaning and Carcass Performance

Breed of Sire	Hamp.	LW.	Hamp.x Loc.	LW.xLoc.	Approx. SE of Mean
Breed of Dam	LW.	LW.	LW.	LW.	
Number of pigs	64	64	64	64	
Av. age at slaughter (days)	162.8 ^a	165.2 ^b	167.5 ^c	172.0 ^d	1.41 *
Av. weight at slaughter (kg)	60.1	59.94	61.2	60.4	0.95
Av. cold carcass weight (kg)	44.0	43.4	43.9	44.6	0.62
Av. dressing percentage	73.2	72.4	71.8	70.8	1.71
Av. carcass length (cm)	68.1	69.02	68.7	67.9	0.95
Av. back fat thickness (mm P ₂)	16.1 ^{bc}	18.0 ^b	14.2 ^a	14.5 ^{ac}	1.60**
Av. eye muscle depth (mm)	40.2 ^b	40.1 ^b	37.2 ^a	36.2 ^a	0.90**
Av. eye muscle area (cm ²)	24.1 ^b	23.8 ^b	21.4 ^a	20.2 ^a	1.01 *
Av. carcass lean cuts (%)	58.7	56.5 ^b	55.4 ^{ab}	54.8 ^a	1.35 *
Av. carcass fat %	29.3 ^c	30.6 ^{ac}	32.1 ^{ab}	32.8 ^b	1.98**
Av. carcass bone %	11.8	11.4	10.4	10.8	1.21
Av. daily gain (kg)	0.48 ^c	0.46 ^b	0.46 ^{ab}	0.42 ^a	0.064 *
Feed Conversion Ratio (Feed/Gain)	3.49	3.67	3.73	3.98	0.79 *

* P 0.05

** P 0.01

a,b,c,d = Means followed by similar superscripts on the same horizontal lines are not different significantly.

The post weaning and carcass performance are shown in Table 2. Highly significant genotypic difference were recorded for backfat thickness, eye muscle depth and percent fat in the carcass (P 0.01) while there were significant differences (P 0.05) in number of days to slaughter, eye muscle area, percent lean in the carcass and the average daily gain.

The progenies of crossbred local boars were 4.0 and 6.9 days late (167 and 172 days respectively) to attain 60kg slaughter weight over those of their purebred

counterparts (with 163 and 165 days. The progenies of purebred Large White were about 1% longer but had about 17% more backfat (18mm compared to 14 to 16mm of the other progenies) while the offspring of the crossbred boars had 7 to 10% lesser muscle depth (36 to 37 mm as against 40 mm) and 11 to 15% lesser eye muscle area (20 to 21 cm² compared to 23.8 — 24 cm² of the purebred progenies). There was a corresponding reduction of 2 to 5% in the carcass lean percent but a significant 3 to 8% higher percent carcass fat.

TABLE 3:
Prime Cuts as Percent Chilled Carcass weight

Breed of Sire	Hamp.	LW.	Hamp.x Loc.	LW.xLoc.	Approx. SE of Mean
Breed of Dam	LW.	LW.	LW.	LW.	
Number of Pigs	64	64	64	64	
% Ham	32.4 ^{ab}	33.1 ^a	31.8 ^b	32.0 ^{ab}	0.61*
% Loin	28.6	29.4	28.7	28.2	1.15
% Shoulder	14.8 ^{ac}	13.6 ^c	15.1 ^{ab}	16.1 ^b	0.98*
% Belly	16.5 ^c	17.0 ^{bc}	17.9 ^{ab}	18.4 ^a	0.64*

* B 0.05

a,b,c. = Means followed by similar superscripts on the same horizontal lines are not significantly different from each other.

TABLE 4:
Least Square Estimates of the Effects of breed of boar.

Breed of	Daily gain	Age at Slaughter		Kill out %		Back fat depth		S.E.
	Difference	S.E.	Difference	S.E.	Difference	S.E.	Difference	
HP LC-HP	-0.033	0.05	4.04	1.3	10.64	0.08	-1.9	0.02
LW LC-LW	-0.045	0.22	6.89	1.5	1.5	0.91	-3.4	0.43*

HP LC = Hampshire x Local; HP = Hampshire
LW LC = Large White x Local; LW = Large White.

* P 0.05.

1.0% higher carcass yield and approximately 1 cm extra carcass length.

However, they were surpassed by the Large White x Local crosses in the yield of the different joints, 32% ham, 161% shoulder and 18.4% belly cuts compared with 31.8, 15.1 and 17.9 of the former, with little or no difference in the backfat thickness 14.2 and 14.5 mm respectively; the carcass lean (55.4 and 54.8%), carcass fat (32.1 and 32.8%) and bone percent (10.4 and 10.8%) respectively. Encouraging improvements were obtained in the use of crossbred boars over the purebred Locals in both litter performance and carcass characteristics (Table 4 and 5) from higher values obtained in the litter size, pig birth weight and weaning weights.

The improvement in the feed conversion and daily gain (Table 5) of 0.37 and 0.03 respectively had greatly reduced the age at 60kg by 4 to 7 days in the offspring of crossbred boars.

The 33g additional daily gain incurred by the offspring of the improved Hampshire boar had resulted in the reduction of 4 days in their age at slaughter. The relative prime cuts in the carcass are presented in Table 3. Significant differences (P 0.05) were recorded in the ham, should and belly cuts.

The Large White boars had offspring with highest percent of ham, recording 4% more ham yield (33% of the carcass) while the Local crosses had higher percentage shoulder and belly cuts of 9 and 8% more (15 to 16% of the carcass) respectively compared to 14% and 15% yield of the progenies of purebred sires.

Relative to the Large White x Local crossed boar, the Hampshire x Local boar had 0.7% more offspring which had about 1.5% higher birth weight and 5% higher weaning weight and were 4.5 days earlier to reach slaughtered weight with

TABLE 5:
Comparison of Heterosis Estimates for Pig Performance

ITEMS	Litter Size	Birth weight	Weaning weight	Days to slaughter	Feed efficiency	Daily gain	Kill out %	Lean %
	Difference S.E.	Difference S.E.	Difference S.E.	Difference S.E.	Difference S.E.	Difference S.E.	Difference S.E.	Difference S.E.
2 breed cross Hamp.-Loc.	0.63 0.08	0.175 0.01	2.275* 0.97	-6.5* 1.23	0.46 0.01	0.029 0.01	-3.75* 0.88	1.55 0.17
2 breed cross LW.-Loc.	1.11 0.11	0.105 0.07	1.92* 0.58	-3.5* 0.95	0.37 0.24	0.031 0.01	-1.35 0.91	1.65 0.56
Fat %								
Bone %								
Difference S.E.				-1.85 0.92	0.15 0.08			
Difference S.E.				20.75 0.621	0.1			

* P 0.05

a — Fetuga et al (1976).

Although there was a significant reduction ($P = 0.05$) in the kill out percentage by 1.4 to 4.0% there was a considerable increase in the carcass lean of about 2%, this followed by a corresponding significant decrease in the fat and an insignificant increase in bone percent.

DISCUSSION

The major genotype of significance is the boar cross between the Local and improved pigs, a comparison of which is required within the same environment as the exotic boar to determine its contribution as a sire line on further growth and carcass characteristics of the offspring. The Local breed are characterised by their slow growth rate and an inferior carcass composition compared to the exotic improved breeds (Vohdrasky, 1968; Cameron and Ashton, 1969; Ilori, 1974 and Fetuga *et al.*, 1976).

Crossbreeding has therefore been embarked upon to upgrade this breed of pigs. Significant heterotic advantages had been recorded for this breed through crossbreeding over the performance reported for this breed of pigs Fetuga *et al.* (1976).

In comparison with the improved breeds the only significant difference was recorded for the days to slaughter between the progenies of these crosses and the improved boars.

Some measure of improvement had also been conferred on this breed by crossbreeding procedure. The higher rate of lean deposition and faster growth rate of the Hampshire breed (Smith, Barsand Tonks, 1973; Smith and Lishman, 1974; Lishman and Smith, 1979) had been utilized to some advantage in the improved litter productivity of the crossbred boar with Hampshire origin, while a combination with the Large White and left us with some advantages in the weight of the different cuts. Breed differences had similarly been reported for prime cuts in

Hampshire x Large White crosses (Lishman and Smith, 1969). Higher yield from carcasses of crossbred boars had also been reported (Smith, Toft and Handscombe, 1978; Lishman and Smith, 1979) resulting in higher cut-out values.

It was not possible to explain what might have been responsible for the reduction in back fat thickness of these pigs relative to 16.5 to 32 mm back-fat thickness reported in most literature covering both exotic pure and crossbred pigs and the pure Local pigs. This reduction however is of particular significance to consumers of fresh pork in this country since a greater percentage of consumers are scared of fatty pork cuts.

Although similar trials involving slaughter of crossbred progenies of crossbred boars of Nigerian Local pigs have not been reported, there is evidence that their use as crossing sires had significant advantages and hold promise for rapid expansion of the pig industry in this country. There is the tendency for the crossbred boars to perform better than the purebred exotic in this environment to show greater libido and possess longer useful life than the imported improved breeds since they are being bred selected improved and utilized in their own environments.

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