

Effect of genotypes on growth and reproductive ability of crossbred pigs in humid tropical environment

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ABSTRACT

Thirty six breeding pigs (six boars and thirty gilts) were used to produce 197 progenies in a Completely Randomized Design experiment to determine the effect of genotypes on growth and reproductive ability of pigs and their crosses in humid tropic. Reproductive performance: Gestation Period (GP), Litter size at birth (LSAB), Litter weight at birth (LWAB), Litter size at weaning (LSAW) and Litter Weight at Weaning (LWAW) were taken for comparison among crossbred pigs. Result showed that Significant ($p < 0.05$) effect of genotypes was observed on GP, LSAB, LSAW and LWAW. Large white x Large white (Lw x Lw) progenies recorded highest ($p < 0.05$) LSAB (9.40 ± 0.678) while, Nigerian Ingenious Pigs x Nigerian Ingenious Pigs (NIP x NIP) recorded least LSAB (4.00 ± 0.548). Lw x Lw progenies recorded highest LWAW (8.00 ± 0.707) whereas, NIP x NIP had least value of LSAW (3.00 ± 0.316). Crossbred Large white x Landrace (Lw x Lr) recorded highest LWAW (51.64 ± 6.20) while, NIP x NIP recorded least LWAW (11.96 ± 1.55). GP of pigs ranges from 114 to 117 days. Crossbred Lw x Lr had highest GP (117 days) while, NIP x NIP recorded least GP (114 days). Significant ($p < 0.05$) effect of genotypes on Body weight (BW) was observed in all the weeks, except at week 2. At week 0, 6 and 16, crossbred Lw x Lr significantly ($p < 0.05$) recorded highest BW ($1.39 \pm 0.11\text{kg}$), ($8.89 \pm 0.11\text{kg}$) and (18.30 ± 0.62), while, NIP x NIP progenies recorded least BW ($0.89 \pm 0.01\text{kg}$), (3.96 ± 0.30) and (9.34 ± 0.51) respectively. In conclusion, progenies from crossbred Lw x Lr performed better than other genotypes in growth and reproductive performance while, progenies from NIP x NIP recorded the least.

Keywords: Genotypes, growth, reproductive abilities, crossbred pigs

INTRODUCTION

Pig is one of the livestock with high fecundity and fast growing that can convert feed and food waste to valuable products (Borkotoky *et al.*, 2014). Nigerian indigenous pigs have also been reported to reproduce under low planes of nutrition (Adeola and Omitogun, 2012). Use of local pigs also contributes to conservation of the local gene pool, at the same time promoting the utilisation of their valuable genes (Scherf, 1990; Ly, 2000). Crossbreeding is the most widely used production system in the swine industry, and thus the genetic improvement goal is to improve crossbred performance under commercial conditions

(Pathiraja, 1986). It is widely believed that crossing local and imported genotypes improves fertility through exploiting heterosis (Lekule *et al.*, 1990). These are desirable genetic attributes that can be harnessed during crossbreeding for development of higher litter size and reproductive traits among our native pig genotypes before they become extinct.

Profitability in pig enterprise primarily depends upon overall reproductive performance of the pigs comprising age at first farrowing, farrowing interval, litter traits, sex ratio, and pre-weaning

mortality (Peltoniemi, 2007). Reproductive performance is reflected in litter size and weight at birth and at weaning. Body weight is an economically important trait (Cam *et al.*, 2010). Body weight is an essential component of breed evaluation and it plays a key role in breeding value determination. Bodyweight and other linear body measurements of individual animal take a crucial role in selection for growth rate in livestock (Buvanendran and Olorunju, 1985). Growth can also be defined as an increase in size and mass of the body, as a result of development and cell enlargement and feed conversion is the measure of animal efficiency in converting feed mass into increase in body mass (Dalton, 1981). Therefore, to achieve better growth rate, selection with potential for appreciable body weight is essential (Ekenyem, 2002). Live weight information can be used to help producers in achieving goals for age at first parturition and to determine the value of culled animals and the efficiency of rearing replacement dams (Dingwell

et al., 2006). It is therefore important to carry out a comparative study to compare the effect of genotypes on the growth and reproductive performance of crossbred pigs and their progenies.

MATERIALS AND METHODS

The experiment was carried out at the Teaching and Research Farm of the Department of Animal Science University of Port Harcourt, Rivers State, Nigeria. The experimental animals, the exotic (Large white and Landrace) and Local pigs were sourced from Benue State Government Swine Project Farm and Gboko village, Benue State, Nigeria, respectively.

The experiment involved three breeds of pigs namely Nigerian indigenous pigs (NIP), Landrace (Lr) and Large White (Lw). A total of thirty – six breeding pigs consisting six boars and thirty gilts were used to produce progeny for the experiment according to the mating scheme with six genotypes as treatments and five replicates.

Table 1: Mating Scheme of Base Population and Number of Progenies Produced

Treatments /Genotypes	Replicates represented by number of progenies from each gilt					Total progenies produced
	1 st Gilt	2 nd Gilt	3 rd Gilt	4 th Gilt	5 th Gilt	
Pure cross						
NIP x NIP	3	4	4	5	5	21
Lr x Lr	7	6	8	9	9	39
Lw x Lw	9	7	10	9	10	45
Main cross						
NIP x Lr	3	4	4	5	6	22
NIP x Lw	7	5	6	6	5	29
Lw x Lr	9	6	7	5	6	33

The mating ratio was 1boar to 5gilts. The experimental animals were kept in production conditions such as comfortable housing, quality feed given at ad libitum, serving fresh water daily and observing other routine management practices. Likewise, the experimental animals were fed according to the standard diets by categories of animals. Piglets were brooded and fed *ad libitum* for six weeks with a commercial pig starter diet containing 22% crude protein and 2900kcal ME/kg. Iron dextran injection was administered to piglets at 2-3 days old to prevent anaemia and

dewormed on routine basis. They were also tagged for proper identification. Water for drinking was provided ad libitum throughout the period.

Parameters and Data Collection

Reproductive performance such as Gestation length (GL), Litter size at birth (LSB), Weight at birth (WAB), Litter size at weaning (LSW) and Weaning weight (WW) were taken from the six different crosses for comparison and evaluation.

- (i) **Birth weight:** Birth weight of the piglets was taken within 24 h post-partum.
- (ii) **Weaning weight:** This is the weight of the animals taken 42 days after birth, when piglets were weaned.
- (iii) **Litter size at birth (LSB)** was taken as the total number of piglets delivered at each farrowing per sow.
- (iv) **Litter size at weaning (LSW)** was taken as the number of piglets that remained alive at weaning, sows which lost all piglets before weaning were removed from the data.
- (v) **Litter weaning weight (LWW)** was taken as the sum of the individual weaning weights in each litter.
- (vi) **Gestation Length (GL):** This was taken from the day the gilts were served to the farrowing day.

Body Weight (kg), which represents the weight of the pig measured in kilogram was taken on each progeny resulting from the six mating types biweekly using weighing scale. The experimental design with which data were collected and analysed was Completely Randomized Design (CRD) with genotype as a factor of interest. The model is given as

$$Y_{ij} = \mu_i + G_j + e_{ij}$$

Where

Y_{ij} = single observation of the i^{th} breed

μ_i = Overall mean G_j = Main effect of breed

e_{ij} = Random error, independently and identically normally distributed with zero mean and constant variance { (iind (0,0)). }

Analysis of variance (ANOVA), using the General Linear Model procedure of Statistical Procedure for the Social Sciences (SPSS), 2013 version 22, was employed in the analysis. Analysis was done on a biweekly basis. The mean separation for significant

effects was done using Duncan's Multiple Range Test (Duncan.1955).

RESULTS

Table 2 shows the reproductive performance of crossbred pigs with the six genotypes. The result shows that there was significant ($p < 0.05$) effect of genotypes on the litter size at birth (LSAB), although the progenies from Lw x Lw recorded the highest LSAB (9.40 ± 0.678) followed by Lr x Lr progenies (7.80 ± 0.583), there was no significant ($p > 0.05$) difference between the LSAB of the progenies from Lw x Lw and Lr x Lr progenies. NIP x NIP recorded the least LSAB (4.00 ± 0.548). Progenies from Crossbred Lw x Lr (6.60 ± 0.67) recorded the highest value among the main cross and NIP x Lw (6.40 ± 0.245) had higher LSAB than NIP x Lr (4.40 ± 0.510). The result also showed no significant ($p > 0.05$) effect of genotypes on the LSAB between progenies of Lw x Lr and NIP x Lw. High body weight at birth could result from the fact that heavy piglets at birth compete well during suckling and are likely to overcome the infectious disease. The genes controlling pre-natal growth may also continue their influence even after birth. It was also suggested that non-additive genetic variation is an important source of variation in growth traits particularly in progenies of crosses of line differing greatly in growth rate and body confirmation.

Significant ($p < 0.05$) effect of genotypes was also shown on the litter size at weaning (LSAW). This also follows the same pattern as the LSAB, where progenies from purebred Lw x Lw recorded the highest LSAW ($8.00 \pm 0.707\text{kg}$) and progenies from NIP x NIP had the least value of LSAW (3.00 ± 0.316). Although there was no significant ($p > 0.05$) effect of genotypes on LSAW between progenies of Lw x Lw and Lr x Lr.

Litter weight at birth (LWAB) was significantly ($p < 0.05$) affected by genotypes influence and it was observed that progenies from purebred Lw x Lw recorded the highest LWAB (12.45 ± 0.89 kg) while purebred NIP x NIP recorded the least LWAB (3.56 ± 0.49 kg) although there was no significant effect of genotypes ($p > 0.05$) on LWAB between progenies from Lw x Lw and Lr x Lr. The result also shows that there was no significant effect ($p > 0.05$) of genotypes on LWAB among the crossbred but progenies from crossbred Lw x Lr recorded the highest LWAB (9.63 ± 0.73) but no genotypes effect on LWAB exist between progenies from crossbred Lw x Lr and NP x Lw. Significant effect ($p < 0.05$) of genotype was observed on the litter weight at weaning (LWAW), where, crossbred Lw x Lr had the highest LWAW (51.64 ± 6.20) and progenies from purebred NP x NIP recorded the least LWAW

(11.96 ± 1.55). This result also showed that significant difference of genotypes did not occur between purebred Lw x Lw and Lr x Lr as well as between crossbred NIP x Lr and NIP x Lw. It is also observed that crossbred NIP x Lw statistically produced heavier LWAW (36.94 ± 1.79 kg) than NIP x Lr (24.88 ± 2.94 kg).

The gestation period of the pigs used for the study ranges from 114 to 117 days. The result shows that there was significant effect ($p < 0.05$) of genotypes on the gestation period, but there was no significant ($p > 0.05$) effect of genotypes on gestation period among Lw x Lw, Lr x Lr, Lw x Lr, NIP x Lr and NIP x Lw. The crossbred Lw x Lr had highest gestation period (117 days) while NIP x NIP recorded the least gestation period (114 days).

Table 2: Reproduction performance of crossbred pigs

Parameters	Lw x Lw	Lr x Lr	NIP x NIP	Lw x Lr	NIP x Lr	NIP x Lw
LITTER SIZE AT BIRTH (LSAB)	9.40 ± 0.68^a	7.80 ± 0.58^{ab}	4.00 ± 0.55^c	6.60 ± 0.67^b	4.40 ± 0.51^c	6.40 ± 0.24^b
LITTER SIZE AT WEANING (LSAW)	8.00 ± 0.71^a	7.00 ± 0.32^{ab}	3.00 ± 0.32^c	5.80 ± 0.58^b	4.20 ± 0.49^c	6.00 ± 0.36^b
LITTER WEIGHT AT BIRTH (LWAB)	12.45 ± 0.90^a	10.63 ± 0.89^{ab}	3.56 ± 0.49^d	9.63 ± 0.73^{bc}	5.17 ± 0.69^d	8.02 ± 0.26^c
LITTER WEIGHT AT WEANING (LWAW)	47.99 ± 5.57^{ab}	36.25 ± 3.95^{bc}	11.96 ± 1.55^d	51.64 ± 6.20^a	24.88 ± 2.94^c	36.94 ± 1.79^{bc}
GESTATION PERIOD (PG)	116.8 ± 0.37^{ab}	116.8 ± 0.37^{ab}	114.00 ± 0.32^c	117.00 ± 0.45^a	115.80 ± 0.37^b	116.40 ± 0.25^{ab}
PERCENTAGE VIABILITY	85.11	89.74	75.00	87.88	95.45	93.75

^{abcd} Mean in the same row with different superscripts are significantly difference ($p < 0.05$).

Lw = Large White Lr = Landrace NIP = Nigerian Indigenous Pigs

Table 3. Shows the mean body weight (BW) for different genotypes from week 0 – 16 of age. Week 0 is weight at birth while week 6 is for

weight at weaning. The result shows consistent increase in body weight with age as expected. The analysis of variance indicated significant ($p < 0.05$)

effect of genotypes in all the weeks, except at week 2. At birth (week 0), significant difference was not observed among the progenies from purebred Lw x Lw, Lr x Lr and progenies from crossbred Lw x Lr, NIP x Lw, but, it is recorded that progenies of crossbred Lw x Lr significantly recorded highest body weight (1.39 ± 0.11) closely followed by progenies of purebred Lw x Lw (1.38 ± 0.02). There was no significant different ($p < 0.05$) between crossbred NIP x Lr and NIP x Lw, but, NIP x Lw were significantly bigger than NIP x Lr at birth. The result also showed that progeny from purebred NIP x NIP recorded the least body weight (0.89 ± 0.01) at birth.

While, effect of genotypes at weaning (week 6), showed significant difference ($P < 0.05$) among the genotypes, crossbred Lw x Lr significantly produced progenies with highest body weight (8.89 ± 0.11 kg) at weaning, while, purebred NIP x NIP progenies recorded the least body weight (3.96 ± 0.30 kg). There was no significant different

between crossbred NIP x Lw and NIP x Lr progenies, but NIP x Lr progenies had higher body weight than NIP x Lw progenies at weaning.

The effect of genotypes at week 16, indicated that there were significant difference ($p < 0.05$) of genotypes on body weight among the six genotypes of pigs, but, crossbred Lw x Lr progenies recorded the highest body weight (18.30 ± 0.62 kg), whereas NIP x NIP recorded the least body weight (9.34 ± 0.51 kg). There was no significant effect of genotypes on body weight at week 16 on progenies from purebred Lw x Lw, Lr x Lw and from crossbred NIP x Lw and NIP x Lr.

Generally, progenies from crossbred Lw x Lr, recorded higher body weight than other genotypes. While, progeny of NIP x NIP recorded the least body weight. In addition, no significant ($p > 0.05$) effect of genotypes on the body weight exists between the progenies of crossbred NIP x Lw and NIP x Lr, but, progenies from NIP x Lr were significant higher than that of NIP x Lw.

Table 3: Mean Body Weight (Kg) Of Crossbred Pigs from Birth (0) to 16 Weeks of age Genotypes

Age(wks)	Lw x Lw	Lr x Lr	NIP x NIP	Lw x Lr	NIP x Lr	NIP x Lw
0	1.389 ± 0.02^a	1.36 ± 0.03^a	0.89 ± 0.01^c	1.39 ± 0.11^a	1.12 ± 0.13^b	1.25 ± 0.13^{ab}
2	3.51 ± 0.35	2.52 ± 0.1	1.64 ± 0.11	3.44 ± 0.11	2.32 ± 0.03	2.54 ± 0.02
4	5.12 ± 0.50^{ab}	4.24 ± 0.42^b	3.01 ± 0.31^c	5.83 ± 0.03^a	4.88 ± 0.11^b	4.77 ± 0.14^b
6	6.14 ± 0.46^b	5.32 ± 0.42^b	3.96 ± 0.30^c	8.89 ± 0.11^a	5.72 ± 0.21^b	5.37 ± 0.72^b
8	7.46 ± 0.46^b	6.57 ± 0.46^b	4.98 ± 0.24^c	11.20 ± 0.20^a	7.03 ± 0.53^b	6.83 ± 0.30^b
10	8.57 ± 0.52^b	7.97 ± 0.48^b	6.03 ± 0.14^c	13.99 ± 0.23^a	8.95 ± 0.34^b	8.12 ± 0.28^b
12	10.09 ± 0.96^b	9.54 ± 0.47^b	7.18 ± 0.35^c	15.17 ± 0.32^a	10.71 ± 0.29^b	9.49 ± 0.39^b
14	11.63 ± 0.96^b	11.52 ± 0.54^b	8.06 ± 0.50^c	16.89 ± 0.53^a	12.27 ± 0.28^b	11.21 ± 0.33^b
16	13.55 ± 0.91^b	13.54 ± 0.67^b	9.34 ± 0.51^c	18.30 ± 0.62^a	13.60 ± 0.12^b	12.46 ± 0.30^b

^{abc} Mean in the same row with different superscripts are significantly different ($p < 0.05$)

Lw = Large White Lr = Landrace

NIP = Nigerian Indigenous Pigs

DISCUSSION

Table 2 showed the reproductive ability of different crossbred pigs. The result obtained is

in agreement with the findings of Eyovwunu *et al.* (2016) where significant differences ($p < 0.05$) of genotypes were observed on the

reproductive performances of pigs. The significant difference among genotype groups in litter size at birth (LSAB) in the study supports the findings of several authors (Pandey *et al.*, 2010 and Eyovwunu *et al.* (2016). The investigations also showed that genotype had a significant ($p < 0.05$) effect on litter weight at birth (LWAB). Significant differences between pig genotypes in litter weight at birth have also been reported by several authors [Oseni (2005); Pandey *et al.* (2010); Nwakpu (2013) and Eyovwunu *et al.* (2016)]. The result obtained in this study corroborated the findings of Nwakpu and Onu (2007) where litter size was significantly ($p < 0.05$) different among the genotype with the reciprocal crossbred having more than the main crossbreds. This is evidenced from native gilts that provided the maternal effect and whose preponderant genes brought down the litter size number. Progenies from Lw x Lw were found superior for litter size at birth (Eyovwunu *et al.* 2016). Piglet birth weight increases with crossbreeding (Oseni, 2005). 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 breed (Oseni, 2005). According to Oseni, (2005) genetic group of litter had a significant effect on this litter size at birth ($p < 0.05$). Significant differences between genetic groups in Litter size at birth are not different from the reports in the literature from the humid tropics and in the temperate regions alike (Pathiraja, 1986).

The significant ($p < 0.05$) effect of genotypes on litter weight at weaning (LWAW) in the present study corroborates the earlier findings of Lakhani and Jogi (2000); and Pandey *et al.* (2010). The result showed that NIP x NIP had 4.00 ± 0.55 and 3.00 ± 0.30 for both LSAB and LSAW respectively, these values were

relatively lower than the LSAB and LSAW recorded by Oluwole *et al.* (2014) (5.36 ± 1.87 and 5.29 ± 1.97).

Likewise, the result of this investigation is in agreement with the findings of Okoro and Mbajiorji (2015), where the progenies from crossbred Lw x Lr recorded the highest weaning weight while, the progenies from NIP had the least weaning weight. Nwakpu (2013) also recorded (6.5 ± 1.66 ; 8.9 ± 1.51 ; 7.2 ± 1.10 ; 8.20 ± 2.50 and 6.50 ± 1.70) for NIP x NIP; Lw x Lw; Lr x Lr; NIP x Lw and NIP x Lr respectively. These were slightly higher than the values from the genotypes obtained in this study.

The results obtained by Eyovwunu *et al.* (2016) indicated that Lw x Lw had the highest LSAB and closely followed by Lr x Lr, that result is in agreement with the findings of this study but, it was observed that Lw x Lw and Lr x Lr recorded higher LSAB (9.40 ± 0.68 and 7.80 ± 0.58) in this study than what Eyovwunu *et al.* (2016) obtained in their findings (6.17 ± 1.47 and 5.00 ± 0.00) respectively.

The mean LWAW recorded in this study for NIP (3.56 ± 0.49) falls within the range of 2.99 to 8.17kg reported by Sunday (1997) but lower than the result obtained by Adeoye (2002) and Akinokun and Ajayi (2013) with (5.22 ± 0.34) and (5.44 ± 0.12 kg) respectively.

The result obtained on the gestation period was in agreement with the findings of Ncube *et al.* (2003) and Eyovwunu *et al.* (2016), where the gestation period of Lw, Lr and their crosses lied between 115 and 118, while, Local pigs fall between 111.7 and 114 days. The gestation period of NIP (111.7 days) was significantly shorter ($p < 0.01$) than that of Lw (116.0 days) (Eyovwunu *et al.* 2016). The gestation period observed in this study also agreed with the findings of Ncube *et al.* (2003), who reported gestation lengths of 113 to 138 days for Mukota sows. The longer

gestation periods observed in the sows carrying crossbred pigs could be as a result of larger size of crossbred sows compared to that of Nigerian indigenous pigs. The result obtained in this study, however, agrees with Ncube *et al.* (2003) who reported that local sows that had been mated to Lw boars had longer gestation periods than those mated to local boars. Therefore, the improvement in this trait can be done by planned crossbreeding in order to exploit the existing heterosis.

The significant ($p < 0.05$) effect of genotypes on litter weaning weight (LWWT) in the present study also corroborated the earlier findings of Lakhani and Jogi (2000); and Pandey *et al.* (2010). While, Okoro and Mbajiorgu (2015) reported that crossbred performance was poor for Indigenous Pig (NIP) x Lw and NIP x Lr, suggesting less importance of non-additive gene action compared to Lw x Lr cross. The difference between these results could be as a result of different breeds of sows and management practices. The high correlation observed between litter size at birth and at weaning is expected because an increase in the number of piglets in a litter will cause an increment in the total litter weight. The correlation between the litter size and weaning weight is corroborated with the findings of Nwakpu (2013) and Khalil, *et al.* (1986) that there is positive and significant correlation between the litter size and weaning weight.

The result obtained in this study corroborated with findings of Nwakpu and Onu (2007) where litter size was significantly ($p < 0.05$) vary among the genotypes with the reciprocal crossbred having more than the main crossbreds. This is evidenced from native gilts that provided the maternal effect and whose preponderant genes brought down the litter size number. Progenies from Lw x Lw were found superior for litter size at birth compare to other genotypes (Eyovwunu *et al.*, 2016).

Significant ($p < 0.05$) effect of genotypes was observed on litter size at weaning. Lw x Lw had the highest litter size at weaning (8.20 ± 0.73), Lr x Lr (7.00 ± 0.32), Lw x Lr (6.00 ± 0.78). While, NIP x NIP recorded the least litter size (3.20 ± 0.20) at weaning. This was also in agreement with observation of Nwakpu and Onu (2007) and Eyovwunu *et al.* (2016) where litter size was statistically ($p > 0.05$) different among the genotypes with reciprocal crossing having more than the main cross bred. Likewise, litter size at weaning for NIP x Lr higher than from NIP x Lw. The result obtained in this study is contrary to the findings of Ncube *et al.* (2003) where there was no effect of genotypes on litter size and the number of piglets that were weaned ($p > 0.05$). Litter size at birth and the number of piglets that were weaned were higher in crossbred than in local pigs ($p < 0.05$). Litter size at weaning is function of litter size at birth due to either the greater liveability on the part of crossbred Lw x Lr progenies as result of hybrid vigour or attributed to the improved maternal ability on the part of crossbred Lr x Lw. Crossbred Lw x Lr are therefore, useful for carrying out selection aimed at improving reproduction and growth performance.

Table 3 shows the results of means of crossbred pigs from week 0 – 16 weeks, the result obtained in this study were similar to the findings of Nwakpu (2013) who observed significant difference ($p < 0.05$) effect of genotypes on body weight at birth and at weaning where crossbred progenies performed better than other genotypes.

Okoro and Mbajiorgu (2017) also recorded similar result, where the results of their investigation showed that Lw x Lw ($1.42 \pm 0.06\text{kg}$), Lr x Lr ($1.53 \pm 0.07\text{kg}$) and NIP x NIP ($0.92 \pm 0.03\text{kg}$) recorded higher body weight at birth than the body weight obtained from progenies of Lw x Lw ($1.39 \pm 0.02\text{kg}$), Lr X Lr ($1.36 \pm 0.03\text{kg}$) and

NIP x NIP ($0.89 \pm 0.01\text{kg}$) respectively in this study. But, the body weight at birth obtained by the same authors from the progenies of Lw x Lr ($1.22 \pm 0.04\text{kg}$), NIP x Lr ($0.94 \pm 0.03\text{kg}$) and NIP x Lw ($1.01 \pm 0.05\text{kg}$) were slightly lower than the body weight recorded for crossbred progenies Lw x Lr ($1.39 \pm 0.11\text{kg}$), NIP x Lr ($1.12 \pm 0.13\text{kg}$) and NIP x Lw ($1.25 \pm 0.13\text{kg}$) in this finding.

Body weight at weaning recorded in this study is lower in progenies from Lw x Lw ($6.14 \pm 0.46\text{kg}$), Lr x Lr ($5.32 \pm 0.42\text{kg}$), NIP x NIP ($3.96 \pm 0.30\text{kg}$), NIP x Lr ($5.72 \pm 0.21\text{kg}$) and NIP x Lw ($5.37 \pm 0.72\text{kg}$) compared to the body weight obtained by Okoro and Mbajiorgu (2015) for the progenies from Lw x Lw ($7.25 \pm 0.36\text{kg}$), Lr x Lr ($7.37 \pm 0.30\text{kg}$), NIP x NIP ($5.36 \pm 0.15\text{kg}$), NIP x Lr ($6.66 \pm 0.39\text{kg}$) and NIP x Lw ($6.85 \pm 0.39\text{kg}$) respectively. But, it was observed that progenies from crossbred Lw x Lr ($8.89 \pm 0.11\text{kg}$) had higher body weight at weaning in this study than Lw x Lr (7.51 ± 0.34) recorded by (Okoro and Mbajiorgu, 2015).

Oseni (2005) and Pandey *et al.*, (2010) also reported that crossbred Lw x Lr was significantly highest ($p < 0.05$) for body weight at birth, weaning and 20 weeks of age. The significant difference observed among the crossbred pigs can contribute to the improvement of the native pigs. Nwakpu (2013) also reported that Large white produced progenies with higher body weight at birth and at weaning than Landrace and Native pigs.

According to Oseni (2005), progenies from the Lw x Lw recorded the heaviest weight at birth, followed by the (NIP x Lw) x Lw, while litters from the NIP x Lw and (NIP x Lw) x NIP were similar ($P > 0.05$) and heavier than progenies from the NIP x NIP group ($p < 0.05$). This observed trend in body weight at birth could be due to the large size of Lw sows and

boars - about twice the size of the NP (Adebambo, 1986). According to Adeoye (2012), the inheritance of the traits in the crossbred pigs were as a result of non-additive genetic effects. The superior weaning weight of the progenies of the crossbred pigs in this study also indicate that the total litter weight at weaning was higher for the crossbred pigs and this was in line with (Oluwole *et al.*, 2014). The implication of this in breeding programme is to plan and encourage crossbreeding in order to exploit the existing heterosis in crossbred Lr x Lw pigs. Such findings could also support the argument that crossbred pigs can be utilized under smallholder farming systems. Whittemore and Schofield (2000) suggested that the high weaning weights of crossbred pigs could also have been a reflection of their higher birth weights. Ncube, *et al.* (2003) reported that the heavier piglets of the crossbred were better and able to compete for milk because they were thrifter and hence had higher chances of surviving up to weaning.

CONCLUSION

The results obtained in this investigation showed that progenies from crossbred Lw x Lr performed better than progenies from other genotypes in growth and reproductive ability. Therefore, crossbreeding of the Nigerian indigenous pigs with high productive exotic breeds (such as Large white and Landrace) in most cases results in heavier weaners and faster growth of fattening stock when compared with the pure indigenous parents. These are desirable genetic attributes that can be harnessed during crossbreeding for development of higher body size and reproductive traits among our native pig genotypes before they become extinct.

REFERENCES

- Adebambo, O. A. 1986. Genetic and environmental effect on litter productivity of exotic and indigenous pure and crossbred pigs in Nigeria. Bulletin of

- Animal Health and Production in Africa 34 (2), 75-80.
- Adeola, A.C. and Omitogun, O.G. 2012. Characterization of indigenous pigs in Southwestern Nigeria using blood protein polymorphisms. *Animal Genetic Resources/Ressources génétiques animales/Recursos genéticos animales*, (51), 125-130.
- Adeoye, A.A. 2002. Repeatability of litter traits of indigenous sows of Nigeria. M.sc Thesis, Department of Animal Science, Obafemi Awolowo University, Ile Ife, 86pp.
- Akinokun, J. O and Ajayi B. A. 2013. Evaluation of some litter traits and heritability estimates of Nigerian indigenous pigs," *International Journal of Applied Agricultural and Apicultural Research*, 9(1 and 2), 113-119.
- Borkotoky, D., P. Perumal and R.K. Singh 2014. Morphometric attributes of Naga local pigs. *Veterinary Research International*, 2 (1), 8-11.
- Buvanendran, V. and Olorunju, S. A. S. (1985): Chest girth measurements in selection for body weight in cattle. *Journal of Anim. Prod. Res.* 5, 125 – 130.
- Cam, M.A., Olfaz, M. and Soydan, E. (2010). Possibilities of Using Morphometrics Characteristics as a Tool for Body Weight Prediction in Turkish Hair Goats (Kilkeci). *Asian Journal of Animal and Veterinary Advances*, 5: 52-59.
- Dalton, D.C. (1981). An introduction to practical animal breeding. Second edition Collins professional and technical books London pp 51-54.
- Dingwell, R., M. Wallace, C. McLaren, C. Leslie, and K. Leslie. 2006. An evaluation of two indirect methods of estimating body weight in Holstein calves and heifers. *Journal of Dairy Sci.* 89:3992-3998.
- Duncan, D. B. 1955. Multiple range and multiple F- test. *Biometrics*, 11, 1-42.
- Ekenyem, B. U. 2002. The growth responses of weaner pigs fed varying levels of palm kernel cake. Proc. 27th Annual NSAP Conf., Akure, Pp. 156 – 159.
- Eyovwunu, D, Omeje, S. I. and Akpodiete, J. O. (2016). Effects of genotype on the reproductive traits of the female pigs *IOSR Journal of Agriculture and Veterinary Science* 9(3), 20-22, DOI: 10.9790/2380-09312022
- Khalil, M. H., Owen, J. B. and Afifi, E. A. 1986. A review of phenotypic and genetic parameters associated with meat production traits in rabbits. *Animal Breeding Abstracts*, 9, 725-749.
- Lakhani, G. P. and Jogi, S. 2000. Studies on preweaning body weights of indigenous pigs and their Large White Yorkshire crosses. *Indian Veterinary Medical Journal*. 24, 231-32.
- Lekule, F. P., Sarwatt, S. V. and Kifaro, G. C. 1990. The role and potential of indigenous local pigs in developing countries; Tanzania Society of Animal Production Proceedings 17, 79-85.
- Ly, J. 2000. A short review on digestive processes in the Cuban Creole pig; *Cuban Journal of Agricultural Research* 34, 181-188.
- Ncube, M., Dzama, K., Chimonyo, M., Kanengoni, A. and Hamudikuwanda, H. 2003. Effect of Boar Genotype on Reproductive Performance of the Local Sows of Zimbabwe. *Livestock Research for Rural Development*, 15, 23 - 28.
- Nwakpu P. E., and Onu, P. N. 2007. Correlations between some weaning traits in four strains of F1 piglet genotypes," *Journal of Animal and Veterinary Advances* 6(10), 1238-1241.
- Nwakpu, P.E. 2013. Preweaning litter growth and weaning characteristics among inbred and cross bred native by exotic piglet genotypes. *Agriculture and Biology Journal of North America* .4(4).393.397
- Okoro, V. M.O. and Mbajorgu, C. A. 2015. Estimates of crossbreeding parameters for growth and conformation traits in Nigerian indigenous and exotic pig breeds. *Applied ecology and environmental Research* 15(4), 117-128.
- Oluwole, O. O, Tiamiyu, A. K. T. O. Olorunbounmi, M. O. Oladele-Bukola and N. A. Akintoye, 2014. "Pre-weaning growth traits in Nigerian indigenous pig

- crossbreds,” *Agricultural Sciences*, 5, 891-896.
- Oseni, S. 2005. Evaluation of the F1 and backcrosses of Nigerian local pigs and the Large White for litter characteristics in Southwest Nigeria. *Livestock Research for Rural Development*. 17(4), 102 - 109
- Pandey, A., S. K. Singh, and Pandey, A. K. 2010. Studies on genetic and non-genetic factors affecting reproductive traits in Landrace desi and their crossbred pigs. *Journal of Ecological and Environmental Science*. 1 (1), 7-10.
- Pathiraja, N. 1986. Improvement of pig meat production in developing countries. I. Exploitation of hybrid vigour (heterosis); *World Animal Review* 60, 18-25.
- Peltoniemi M. Heinonen, 2007. Feeding affects reproductive performance and reproductive endocrinology in the gilt and sow. *Acta Vet Scand*. 49(1), 6-10.
- Scherf, B. D. 1990 Effects of improved management practices on traditional smallholder pig production in Zimbabwe, Research report, Department of Research and Specialist Services, Ministry of Agriculture, Zimbabwe.
- Sunday, W.A. 1997. The effect of substitution of maize with different levels of cassava root meal in the diets of gestating and lactating local pigs. Unpublished M.Sc thesis submitted to Department of Animal Science, Obafemi Awolowo University, Ile-Ife. pp 30- 40.
- Whittemore, C.T., and C.P. Schofield. 2000. A case for size and shape scaling for understanding nutrient use in breeding sows and growing pigs. *Livestock Production Sci*. 65, 203-208.