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Phenotypic Evaluation of Nigerian Indigenous Pigs (NIP), Its Hybrid and Backcross for Litter and Reproductive Traits During Dry and Wet Season

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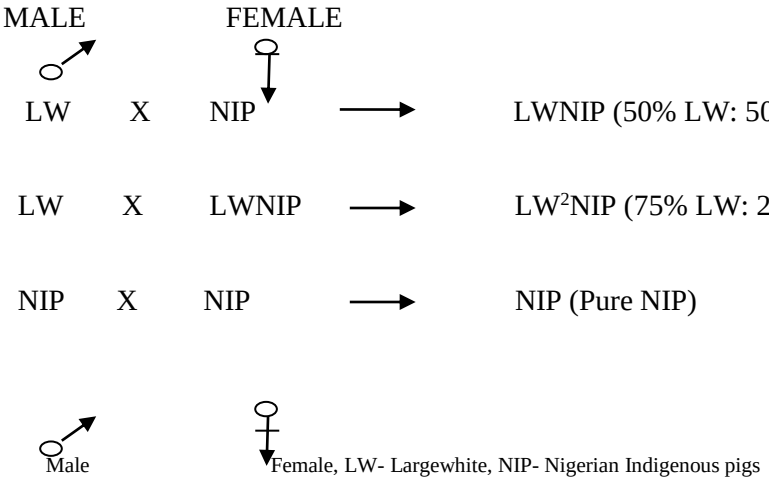
ABSTRACT
Seventy-three progenies consisting pure Nigerian Indigenous pig (NIP) (14), hybrids (50% Large White and 50% NIP) (23) and backcross (75% Large White and 25% NIP) (36) were used for this study. The hybrids (HY) piglets had higher birth weight, weaning weight and pre-average daily weight gain with values of 0.81Kg, 6.60Kg and 0.78Kg respectively, followed by the 75% exotic backcrosses (BC) with values of 0.71Kg, 6.15Kg and 0.69Kg respectively. During dry and wet season, there was no significant difference between the males and the females in birth weight, weaning weight and pre-average daily weight gain. The effect of season of farrowing and sex on the growth parameters was not significantly different (P>0.05). The hybrid had higher values in weight and in all the morphometric parameters taken than that of backcross and of NIP. The backcross had the highest litter size at birth in dry and wet season but had low survival rate. In conclusion, the hybrid performed better than the NIP and backcross in litter traits during wet and dry seasons but the survival rate of backcross to weaning age was lower compared to that of hybrid. Hybrid had the highest survival rate in both dry and wet seasons.
Keywords: Nigerian indigenous pigs, hybrid, backcross, dry and wet season

INTRODUCTION
There are two factors responsible for the genetic make-up of an individual pig. These factors are genotype (gene) and the environment. This can be express as P = G + E (Where P = Phenotype, G = Genotype, E= Environmental effect in which the pig makes its record). These two factors contribute to variations observed in many traits and thereby cause improved performance observed in pigs. The performance of pigs can be improved by improving the environment in terms of plane of nutrition, management, and diseases control e.t.c. and can also be improved by improving the genetic potential or genotype. National Swine Improvement Federation (NSIF), (2001) suggested that the genetic improvement of pig can be obtained by the breeding value of the animals and it must be estimated from the phenotypes (that which can be observed or measured) of the animals themselves and (or) those of their relatives. The phenotypes may be performance records on the prospective replacement stock, or a visual evaluation of the animals or their relatives. Visual evaluation is not recommended for traits which can be measured. The genetic potential of NIP can be improved by selection or by crossbreeding two different breeds in order to combine superior traits. This can be achieved by choosing an appropriate breeding method either to breed pure-breed alone or crossbreeding. This study evaluates pre-weaning litter and reproductive traits of NIP, its hybrid and backcross.

MATERIALS AND METHOD
Seventy-three progenies, from the mating design shown below, consisting pure NIP (14), hybrids (23) and backcross (36) were used for this study. Weights and measurements were taken weekly by the use of weighing scale and by the use of measuring tapes graduated in centimeter for 8 weeks. The body parameters taken were Body weight (WT), Ear length (EL), Body length (BL), Body height (BH), Hearth girth (HG), Neck circumference (NC), Rump circumference (RC) and Tail length (TL). Height at withers or body height (BH), (Distance between the most cranial palpable spinosus and the ground), Body length

(cm), (Distance from the head of the humerii to the distal end of the pubic bone), Hearth girth (cm) (Measured as the circumference of the chest region), Neck circumference (NC) (Measured as the neck circumference), Rump Circumference (the circumference of the loin region), Tail length (cm), (Measured as distance from distal end of the pubic bone to the tip of the tail end). Data on birth weight (BW), weaning weight (WW) and litter size at birth (LSB), litter size at weaning LSW, and the sex of the piglets (SEX) were recorded for each breed. The breeding data involves piglets from pure Nigerian indigenous pig, their crosses (50% LW X 50% NIP) and backcross ((NIP x LW) X LW) i.e (75% large white and 25% NIP) sows.

Table 1:



Data collection

Data collected was subjected to Analysis of variance (ANOVA) using (SAS, 1999) to analyze the effect of breed, season and sex. Duncan's multiple range test was also used to separate significant differences among the means. The model used for the litter traits was:

$$\mathbf{Y_{ijkl} = \mu + B_i + P_j + S_k + (B \times P)_{ij} + (B \times S)_{ik} + E_{ijkl};}$$

Where: Y_{ijkl} = response variable (litter size, birth weight, weaning weight)
μ = overall mean response
B_i = fixed effect of genotype
P_j = fixed effect of season
S_k = fixed effect of sex of piglet
$(B \times P)_{ij}$ = genotype x season interaction
$(B \times S)_{ik}$ = genotype x sex interaction
E_{ijkl} = residual error

RESULTS

The effect of genotype and season of farrowing on growth parameters of the NIP, hybrid and backcross is shown in Table 2. The hybrids (HY) piglets performed better during dry season with values of 0.94±0.02kg and 7.27±0.20kg for BW and WW respectively, followed by the 75% exotic backcross (BC) with values of 0.92±0.017kg and 6.93±0.09kg respectively. This is also presented graphically in Figure 1.

The effect of sex and season of farrowing on the growth parameters of the NIP, hybrid and backcross is shown in Table 3. During dry and wet season of farrowing, there was no significant difference between the males and the females in Birth weight (BW), weaning weight (WW) and pre-average daily weight gain (PADWG). This is presented graphically in Figure 2.

The effect of genotype and season of farrowing on reproductive parameters is shown in Table 4. The effect of season of farrowing and sex on reproductive parameters showed no significant difference

(P>0.05) as well. This is presented graphically in Figures 3. The backcross had the highest LSB during dry and wet season as shown in Figures 4 to 5. The hybrid had the highest survival rate of 100%. The survival rate of the backcross (83.33%) is comparable to that of the NIP (86.91%) in dry season but higher (84.39%) than the NIP (77.78%) in wet season.

Table 2: Effect of genotype and farrowing season on the pre-weaning growth traits

Breed	N	BW	WW	PADWG
DRY SEASON				
HY	18	0.94±0.02kg^{a}	7.27±0.20kg^{a}	0.11±0.03kg/day^{a}
NIP	17	0.84±0.03kg^{b}	6.05±0.22kg^{b}	0.09±0.02kg/day^{b}
Backcross	10	0.92±0.017kg^{a}	6.93±0.09kg^{a}	0.11±0.01kg/day^{a}
WET SEASON				
HY	30	0.81±0.02kg^{a}	6.84±0.17kg^{a}	0.11±0.02 kg/day^{a}
NIP	10	0.67±0.04kg^{b}	5.09±0.27kg^{b}	0.08±0.02 kg/day^{b}
BC	33	0.68±0.04kg^{b}	7.10±0.43kg^{a}	0.12±0.06 kg/day^{a}

$^{a, ,b,}$ *Mean within the same column with different superscript letters, were different (P<0.05)*

BW-Body weight, WW- Weaning weight, PADWG- Preweaning-average daily weight gain, HY- Hybrid, NIP-Nigerian indigenous Pig, BC=Backcross

Table 3: Effect of sex and season of farrowing on the growth traits

	Male	Female
Wet season		
N	38	35
BW	0.73±0.02kg	0.72±0.04kg
WW	6.48±0.13kg	6.00±0.33kg
PADWG	0.10±0.02kg/day	0.09±0.20kg/day
Dry season		
N	24	21
BW	0.92±0.03kg	0.92±0.02kg
WW	7.04±0.25kg	6.87±0.17kg
PADWG	0.11±0.04kg/day	0.11±0.11kg/day

BW-Body weight, WW- Weaning weight, PADWG- Pre-average daily weight gain, HY- Hybrid, NIP-Nigerian indigenous Pig.

Table 4: Effect of genotype and season on reproductive parameters of NIP, hybrid and backcross

	Mean of Litter Size		
	LSB	**LSW**	**SR%**
Dry season			
HY	6.00[b]	6.00[b]	100.00[a]
NIP	6.33[b]	5.33[c]	86.91[b]
BACKCROSS	12.00[a]	10.00[a]	83.33[c]
Wet season			
HY	5.00[b]	5.00[b]	100.00[a]
NIP	4.67[b]	3.33[c]	77.78[c]
BACKCROSS	7.80[a]	6.40[a]	84.39[b]

[a,b,c] *Mean within the same column with different superscript letters, were different*
BW-Body weight, WW- Weaning weight, PADWG- Pre-average daily weight gain, HY- Hybrid, NIP-Nigerian indigenous Pig. No- Number, LSB- Litter size at birth, LSW –Liter size at weaning, S.R- Survival rate

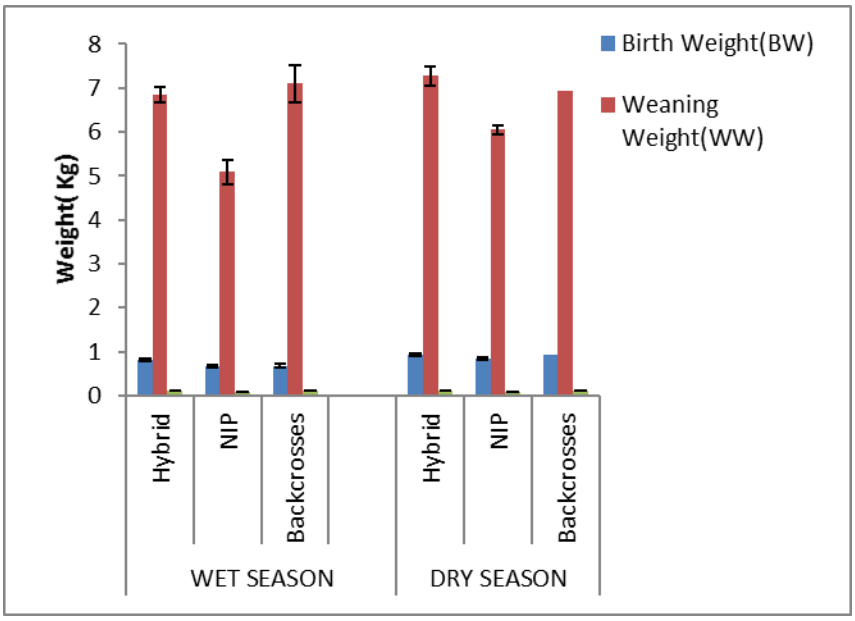


Figure 1: Effect of genotype and farrowing season on growth parameters
BW-Body weight, WW Weaning, PADG- Preaverage daily weight gain F_1- Hybrid, NIP-Nigerian indigenous Pig, BC – Backcrosses

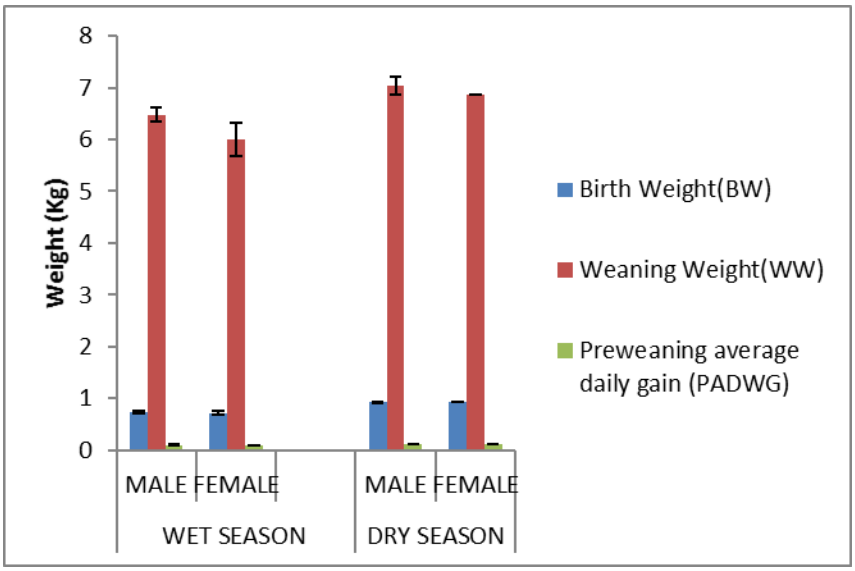


Figure 2: Effect of seasons of farrowing and sex on growth traits
BW-Body weight, WW Weaning weight, PADWG- Pre-waverage daily weight gain.

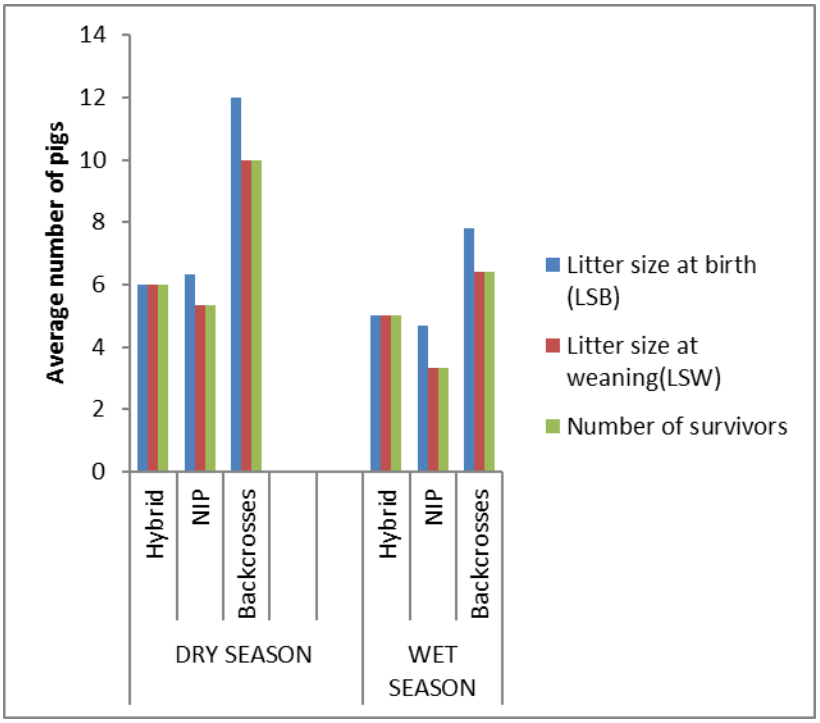


Figure 3: Effect of genotype on the litter size at birth and weaning during the dry and wet season. BW-Birth weight, WW
Weaning weight, LSB-Liter size at birth F_1- Hybrid, NIP-Nigerian indigenous Pig, BC – Backcrosses; SR= Survival rate

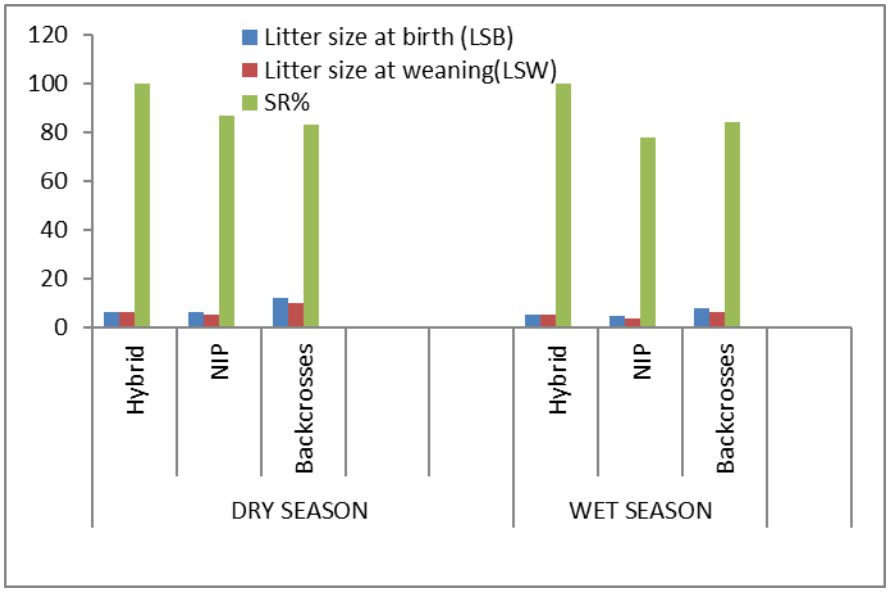


Figure 4: Effect of genotype on the litter size at birth and weaning during the dry and wet season.
BW-Birth weight, WW Weaning, LSB-Liter size at birth F_1- Hybrid, NIP-Nigerian indigenous Pig, BC – Backcrosses; SR= Survival rate

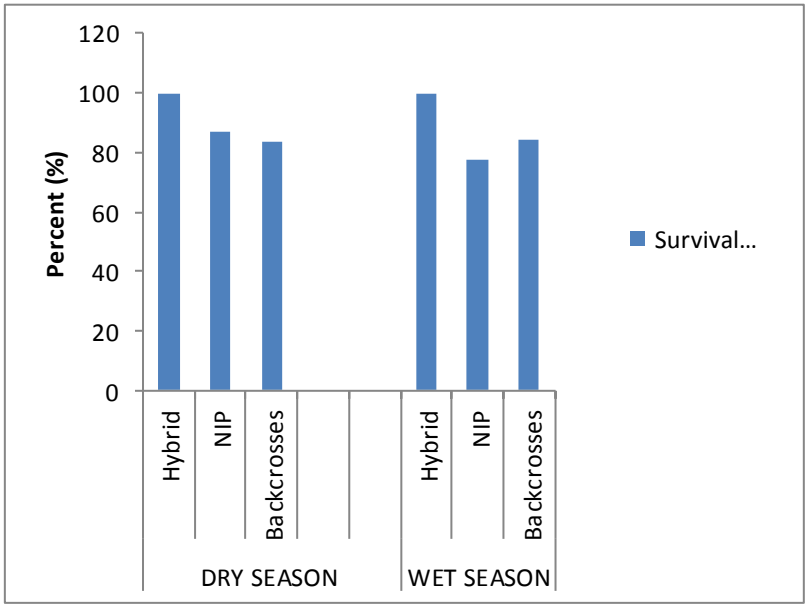


Figure 5: Effect of genotype and season on Survival rate to weaning age.
F_1- Hybrid, NIP-Nigerian indigenous Pig, BC – Backcrosses

DISCUSSION

One of the aims of pig producers is to improve the management of the pre-weaning and post-weaning stages of production to the limits dictated by the genetics of the animals. The major factors that interact in the determination of the quantity and quality of the final pig carcass are the genetics and the environment of the animals and the interaction between the two. Oseni (2005) found that crossbreeding is a successful

management practice for improving litter productivity in swine. Litter size has low heritability (Rico *et al.,* 2000) and crossbreeding has been found to improve it (Adebambo, 1986).

The effect of genotype on pre-weaning weight gain and weight at birth and weaning was significant ($P<0.05$), where hybrid had a higher weight at birth and weaning than Backcross (BC) and NIP piglets. This result was corroborated with the findings of Oseni (2005). The PADWG obtained in this study was lower than those reported by Fetuga *et al.* (1977) a value of 0.32 kg/day for hybrid; Adebambo and Onakade (1983) reported 0.30 kg/day for hybrid while it was closer to that reported by Sonaiya (1986) a value of 0.14 kg/day for the NIP. There was no significant difference ($P>0.05$) in birth weight between male and female piglets within each genotype. This was corroborated with findings of Adeoye *et al.* (2012).

From this study, it can be concluded that the hybrid performed better than the NIP and backcross in litter traits during wet and dry season. The Hybrid also had the highest survival rate during both dry and wet season but the survival rate of backcross to weaning age was lower than that of hybrid.

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