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Reproductive and Hematological Characteristics of the Nigerian Indigenous and Large White Pigs in a Humid Tropical Environment

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Abstract: A comparative study of different reproductive parameters of Large White (LW) and Nigerian Indigenous (NI) pigs was carried out using 9 NI (1 boar and 8 gilts) and 7 LW (2 boars and 5 gilts). Their progenies comprising 20 LW (10 boars and 10 gilts), 22 NI (12 males and 10 females) and 9 LW×NI crossbred pigs (3 males and 6 females) were used to compare the hematological attributes at 9, 17 and 25 weeks of age. The three breeds were managed in a similar fashion. It was observed that heat was virtually silent among the NI gilts and intra breed sexual congresses were more effective than the interbreed congresses. The LW pigs had significantly higher ($p<0.05$) birth weight than the NI pigs (1.3 kg versus 0.8 kg) and had longer gestation period (116.0 days versus 111.7 days) but litter sizes were similar. No significant age or breed differences were found in haematological parameters ($p>0.05$) and the values were within the normal ranges generally accepted as reference values for healthy pigs.

Key words: Indigenous pigs, large white pigs, reproduction, hematology, Nigerian

INTRODUCTION

Meat and meat products are concentrated sources of high quality protein and their amino acid compositions usually compensate for shortcomings in the staple food. It is recommended that one third of daily protein intake should be at least of animal protein origin (WHO, 1985). However, animal protein intake in developing countries is still far below the recommended standards (FAO, 1998). To close up this gap, several strategies have been advocated. Prominent among these is encouraging the developing countries to research and improve the productive potentials of indigenous breeds rather than depend on the exotic breeds, which are usually not well adapted to the environmental and management conditions in the developing countries (FAO, 1992). Countries such as China, which has attained self-sufficiency in pork production, depend heavily on indigenous breeds of pigs. Nigerian indigenous breeds of pigs are often reported as poor producing animals which are unfit for commercial livestock enterprises (Vohdrasky, 1968; Cameron and Ashton, 1969; Ilori, 1974; Fetuga *et al*., 1976; Adebambo, 1981; Umesiobi, 2000). Stock in most commercial pig farms in Nigeria are either exotic or products of indiscriminate cross breeding programmes between exotic breeds and local breeds, such that individual animal performance vary widely between farms and animals, even within the same farm. Productivity of breeding stock is largely dependent on its reproductive efficiency, growth rate and feed conversion efficiency. The first two are largely of genetic origin (Adebambo, 1981, 1983) whereas the third, being environmental is amenable to routine day-to-day manipulation.

Few researchers have studied the reproductive potentials of the indigenous breeds of pigs in Nigeria. Adebambo (1981 and 1983) and Adebambo and Dettmers (1979) reported superior values for body weight, weaning weight at 52 days of age, milk yield and average daily gain for exotic and

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crossbreeds (NI×exotic) over the NI pigs. Fetuga *et al*. (1976) reported that the mean litter size in local pigs was 6.7 piglets and litter weight of 6.10 kg per sow, the values of which were lower than published values for exotic pigs. The best indicator of the animal's well being and its potential for production is its health status. This is because it shows its adaptability to the prevailing interactions between genetic and environmental factors. Different methods have been advocated and used by several people to assess the animal's health status. The most common and comparable tool used by many researchers is the haematological profile. The hematological profiles for the exotic pigs have been widely reported (Benjamin, 1961; Jain, 1986; Kaneko, 1980; Radositis *et al*., 1994). The values vary depending on the age, sex, geographical habitat and laboratory (Radositis *et al*., 1994). Apparently, the haematological status of the NI breed has not been investigated.

This study compared the reproductive potential and haematological counts of the Nigerian Indigenous breed with that of the Large White breed. The haematological assessment included NI×LW cross breeds.

MATERIALS AND METHODS

Management and Feeding of Experimental Animals

Nine Nigerian Indigenous pigs (one male and eight females) and seven Large White pigs (two boars and five gilts) were selected and served as parent stock. All animals were managed in a similar fashion. On arrival, all the animals were dewormed and kept in pens measuring 2×4 m. The boars were housed individually; Large White gilts were kept in pairs while four local gilts were kept in one pen. They were fed a corn/groundnut cake based ration which contained 89.2% dry matter, 10.91 MJ kg^{-1} ME, 14.8% crude protein, 19.0% NDF and 6.6% ADF. All the animals in each pen were fed together with a quantity of feed estimated to be 5% of their live weights.

Reproductive Parameters

The gilts were checked for standing heat by visual observation, sitting and exposure to boars. After a successful service, the dates of service were taken and heat checked after 20-21 days. On confirmation of pregnancy, the in-gilts were kept in pairs until about 100 days after service. About 14 days pre-parturition, the LW dams were transferred to farrowing pens while the local dams were kept individually in their usual pens. At parturition, live weight of piglets were taken and bedding of wood shaving provided until 21 days post partum. The beddings were cleaned daily and changed regularly. Records on gestation length, litter size, weekly weight gain and post-parturition losses (death and still births) were taken. All piglets were ear notched for identification at 7 days post partum.

Blood Sampling and Analysis

A total of 51 piglets comprising 22 NI (12 males and 10 females), 20 Large White (10 males and 10 females) and 9 crosses (3 males and 6 females) were used for hematological studies. At age 9, 17 and 25 weeks of age, 2 mL of blood were sampled from the anterior jugular vein of at least six animals selected at random from each breed, with the sexes equally represented. The samples were quickly transferred (< 45 sec) into EDTA sample bottles and stored under ice. These were later taken to the hematology laboratory for analysis. The time of sampling was usually between 9.00 and 10.00 am while analysis took place within 3 h of sampling. The samples were analyzed for total Red Blood Cell (RBC), Hemoglobin Concentration (HBC), Packed Cell Volume (PCV), total White Blood Cell (WBC) and percentage neutrophil, lymphocytes and eosinophils according to the methods described by Jain (1986). The RBC counts were done in a hemocytometer chamber. Total WBC counts were obtained using a hemocytometer with Natt and Henrick's diluent to obtain a 1:200 blood dilution. The number of white blood cells was then determined as the total WBC $\mu L^{-1} \times 200$. The microhematocrit method

with 75×16 mm capillary tubes filled with blood and centrifuged at 3000 rpm for 5 min was used to determine the PCV. Differential white cell counts were made with blood smears stained with Wright's dye and each type of cell counted with a laboratory counter. The hemoglobin concentration (HBC) was measured using the cyanomethemoglobin method. The Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Volume (MCV) and Mean Corpuscular Hemoglobin Concentration (MCHC) were calculated from the results obtained.

Statistical Analysis

Data from the reproductive performance of the NI and LW breeds were meaned individually and the statistical significance of the difference determined using the student t-test. Hematological parameters were analyzed using the completely Randomized Block Design (CRBD) with the ages (9, 17 and 25 weeks) serving as blocks and breed and sex as treatments. Analysis of variances was done and means separated by the Least Significant Difference (LSD) as described by Little and Hills (1978).

RESULTS

Reproductive Behavior

It was generally observed that oestrus was silent in local pubertal gilts but was better detectable post parturition. The most effective method of oestrus detection was the tendency to stand when mounted by a boar. Swelling of vulva was minimal and the reddening of the vulva usually observed in exotic pigs was conspicuously masked by the dark colour of the external genitalia of the NI pigs, especially during the oestrus prior to first parturition. The NI gilts and sows failed to respond to sitting or ridding by the attendant and were generally more vibrant and aggressive in behaviour. It was observed that intra-breed sexual congress was more effective than the inter-breed congress. Services between the LW boars and NI females, could only effectively take place after the first parturition because by this time the NI sows were big enough to carry the weight of the relatively heavier exotic boar. The NI males were more aggressive and exhibited comparatively shorter reaction and ejaculation times than the Large Whites. The consequence was that when cross breeding was undertaken with local males, the boar ejaculated and dismounted while the female was still standing. When Large White boars were used, the NI female forced the male to dismount such that in all cases, most of the semen was wasted. This may be due to the relatively massive weight of the LW, which became unbearable to the NI dams.

Reproductive Performance

The gestation period of NI females (111.7 days) was significantly shorter ($p<0.01$) (Table 1) than that of LW (116.0 days) and the average birth weight for NI (0.74 kg) was also significantly lower ($p<0.01$) when compared to the LW (1.25 kg). Average pre-weaning mortality among the NI pigs was

Table 1: Comparison of the average reproductive performance of the Nigerian Indigenous and Large White dams

Parameters	NI dams	LW dams
No. of litters	7.0	5.0
Litters size (No.)	5.1±1.68	6.8±1.92
Litter weights (kg)	0.8±0.10[a]	1.3±0.15[b]
Gestation period (days)	111.7±0.49[a]	116.0±2.74[b]
Weaning weight (kg)	3.8±0.59	4.8±0.95
Pre weaning mortality	1.1±1.46	0.0
Still births	0.0	1.0
Weaning age (days)	40.9±7.52	38.4±2.61
Pre-weaning gain (g day^{-1})	78.1±13.95	95.6±25.2

LW: Large White, NI: Nigerian Indigenous [a, b, c] Means within a row with different superscripts are significantly different ($p<0.01$), Data presented as mean±SD

Table 2: The hemoglobin concentration, packed cell volume and red blood cell counts of Nigerian Indigenous, Large White and their F1 crosses at different ages

		NI		LW		F1 crosses		
Parameters	Age (weeks)	Male	Female	Male	Female	Male	Female	SEM
Hemoglobin (g μL^{-1})	9	14.0±0.88	13.7±1.06	nd	nd	11.7±1.57	11.8±1.7	1.84
	17	12.9±0.94	12.8±1.33	11.8±1.32	11.2±1.49	nd	nd	
	25	12.8±0.21	nd	10.8±3.55	12.6±1.13	nd	nd	
PCV (%)	9	42.0±2.76	41.0±3.21	nd	nd	35.3±4.73	35.7±5.47	3.43
	17	38.6±2.83	38.3±4.04	35.3±5.56	33.5±4.46	nd	nd	
	25	38.7±0.58	nd	32.4±11.35	37.7±3.40	nd	nd	
RBC ($\times 10^6$ μL^{-1})	9	5.8±0.99	6.0±0.71	nd	nd	5.0±1.07	4.9±0.68	0.41
	17	5.3±1.29	5.3±1.01	4.8±0.64	5.3±1.03	nd	nd	
	25	5.1±0.44	nd	4.7±1.49	4.8±0.80	nd	nd	

NI = Nigerian Indigenous pigs; LW = Large White pigs; PCV = Packed Cell Volume (Haematocrit); RBC = Total Red Blood cell counts; Data presented as mean±DS; nd = not determined; SEM = Standard Error Mean

Table 3: Red blood cell indices of Nigerian Indigenous, Large White and their F1 crosses at different ages

		NI		LW		F1 crosses		
Parameters	Age (weeks)	Male	Female	Male	Female	Male	Female	SEM
MCV (fl)	9	7.60±1.46	7.0±1.02	nd	nd	7.2±1.08	7.3±0.70	0.32
	17	7.60±1.65	7.3±0.56	7.5±1.08	6.9±1.45	nd	nd	
	25	7.60±0.76	nd	7.2±0.85	8.0±1.24	nd	nd	
MCH (pg)	9	2.50±0.44	2.3±0.34	nd	nd	2.6±2.71	2.4±0.23	0.13
	17	2.50±0.55	2.4±0.19	2.4±0.37	2.1±0.27	nd	nd	
	25	2.50±0.24	nd	2.3±0.29	2.7±0.41	nd	nd	
MCHC (g dL^{-1})	9	33.18±0.41	33.3±0.17	nd	nd	33.3±0.05	33.4±0.10	0.49
	17	33.30±0.19	33.3±0.04	33.4±0.34	33.3±0.09	nd	nd	
	25	33.20±0.13	nd	32.6±1.48	33.3±0.08	nd	nd	

NI = Nigerian Indigenous pigs; LW = Large White pigs; MCV = Mean Corpuscular Volume; MCH = Mean Corpuscular Hemoglobin; MCHC = Mean Corpuscular Hemoglobin Concentration; Data presented as mean±DS; nd = not determined; SEM = Standard Error Mean

Table 4: Differential white blood cell counts of Nigerian Indigenous, Large White and their F1 crosses at different ages

		NI		LW		F1 crosses		
Parameters	Age (weeks)	Male	Female	Male	Female	Male	Female	SEM
Total leucocytes	9	14.9±4.05	18.4±4.29	nd	nd	13.0±4.56	10.2±4.65	2.11
($\times 10^3$ μL^{-1})	17	12.6±3.49	13.4±1.53	12.8±6.66	14.7±7.25	nd	nd	
	25	7.5±2.38	nd	14.2±2.16	11.8±3.95	nd	nd	
Neutrophil (%)	9	33.6±9.09	24.6±7.97	nd	nd	33.3±9.87	25.3±11.02	13.79
	17	26.9±16.2	25.3±9.29	33.7±8.52	46.8±14.68	nd	nd	
	25	46.7±12.90	nd	21.8±12.85	14.7±8.50	nd	nd	
Lymphocyte (%)	9	65.8±8.78	74.3±8.89	nd	nd	66.7±9.87	73.0±8.3	13.77
	17	52.3±12.6	nd	77.8±13.01	85.3±8.50	nd	nd	
	25	72.5±15.8	73.7±10.6	66.3±8.5	52.5±14.6	nd	nd	
Eosinophils (%)	9	0.5±0.69	0.9±1.13	0.0	0.0	0.0	0.0	0.45
	17	0.6±1.41	1.0±1.73	0.0±0.0	0.0±0.0	nd	nd	
	25	1.0±1.73	nd	0.4±0.89	0.0±0.0	nd	nd	

NI = Nigerian Indigenous pig; LW = Large White pigs; Data presented as mean±DS; nd = not determined; SEM = Standard Error Mean

1.1 deaths per litter whereas none occurred in Large Whites. In most of the deaths, the piglets were either very small, weak or both and so could not effectively suckle or avoid overlaying by the more restless dams. No stillbirths occurred among NI pigs whereas one was observed in LW. Differences in weaning weights and pre-weaning daily gain were not significant ($p>0.05$).

Hematology

Breed, sex and age related differences in all parameters were not significant ($p>0.05$). The haemoglobin contents of the red blood cell in all the breeds ranged from 11.7-14.0 g μL^{-1} (Table 2). Among the LW breeds, the red cell count for males at 17 weeks of age were 4.8×10^6 μL^{-1}, while the

values at 25 weeks of age were 4.7×10^6 $\mu L^{-1}$for males and 4.8×10^6 μL^{-1} for females. The ranges of values for the mean corpuscular volume (MCV) were 70 to 80 fl and the Mean Corpuscular Hemoglobin (MCH) were 21-27 pg (Table 3). The total leucocytes count ranged from 7.5×10^3 to 18.4×10^3 μL^{-1} (Table 4). The differential white blood cell counts were 21.8-46.8% for neutrophils, 52.3-85.3% for lymphocytes and 0.0-1.0% for eosinophils.

DISCUSSION

Preliminary observations in this study indicate that the NI breed was relatively more restless, vibrant and aggressive and this made it more difficult to detect the presence of estrus. This behavioral pattern may have contributed to their failure in responding to sitting or ridding by the attendant (a method of detecting estrus), in addition to their being unfamiliar with the practice. Differences in reproductive behavior between the NI and LW breeds necessitate the adoption of appropriate husbandry procedures in managing the local breed in correspondence with its peculiar sexuality, morphology and behavioral traits.

It was observed that birth weight was higher and gestation length longer in the LW breed compared with the NI breed (Table 1). Since litter size was not significantly different ($p>0.05$), it is likely that the smaller birth weight of the NI piglets resulted from the shorter gestation period and/or smaller body sizes of the dams. It has been established that within certain limits the longer the gestation period in mammals, the more mature the offspring (Pallson, 1955). Birth weight is also positively correlated with the placental size, which is responsible for nourishing the fetus in the uterus (Adebambo, 1981; Greenwood *et al*., 2000; Sarin *et al*., 2001). The performance of the NI pigs in this study is similar by Fetuga *et al*. (1976) and Adebambo (1981). The shorter gestation period observed among the NI pigs in this study may have been responsible for the higher pre-weaning mortality. Since the NI piglets were younger at birth, they would probably require more attention and care. The pre-weaning gain of the LW pigs in this study, 639.3 g/week is lower than 820.0 g/week reported by Adebambo (1981). The creep feeding and higher crude protein and calorie content of the ration fed to the dams in the previous study by Adabambo (1981) in comparison to the diet fed to the dams in this study may be responsible for the difference. NI and LW pigs were similar in pre-weaning live weight gain (Table 1), whereas Adebambo (1981) reported that LW pigs were higher in pre-weaning gain. Interestingly, indigenous pigs of West Africa have been reported to perform better than exotics at lower dietary crude protein levels (Ilori, 1974; Fetuga *et al*., 1977; Ilori and Adepoju, 1980; Ilori, 1984) and lower metabolizable energy (Codjo, 2003). It is therefore certain that the reported higher pre-weaning live weight gain by LW pigs over the NI counterpart is dependent on the feeding regimen adopted.

The results showed no significant variations due to breed, sex or age in all hematological parameters. It had been reported that both sex and age influence hematological values in pigs (Radositis *et al*., 1994) and sex-related variations have been reported in guinea fowls and ducks (Orji *et al*., 1986; Okeudo *et al*., 2003). There is scarcity of information on the hematological values of NI and LW pigs reared in the same environment. In this experiment, blood was sampled within a short period (9-25 weeks of age). A close examination of values for hemoglobin content, PVC and RBC counts (Table 2) showed that these parameters decreased generally with increasing animal age. Significant age and sex effects may have been observed if blood-sampling period had been prolonged beyond the 4 months interval adopted in this study. Nevertheless, values for the various hematological parameters reported in this study were generally within the range for healthy pigs as published by Radositis *et al*. (1994). The closeness of the hematological values of NI pigs to widely accepted reference values indicates that published reference values for exotic breeds are relevant to the NI pig. It also demonstrates that the pigs used in this experiment were apparently healthy animals.

CONCLUSIONS

It is recommended that all the pre-farrowing management practices involving the Nigerian Indigenous pigs should start at least one week before the recommended time for the improved breeds and more intensive care is needed to reduce post farrowing losses within the first week of life of the Nigerian Indigenous piglets. Cross breeding between the NI and improved breeds of pigs should be done only after the second parturition of the NI sows, because by this time, it is expected that the NI sows will be big enough to carry the weight of the relatively bigger exotic boars. The published reference values of haematological parameters of improved breeds of pigs are relevant to the NI pigs. More information is needed urgently on the reproductive physiology and behavioral traits of the NI pigs, so that requisite strategies for better management of the breed may be designed.

REFERENCES

Adebambo, O.A. and A.E. Dettmers, 1979. A comparison of the milk composition of the indigenous sows of Nigeria with that of the exotic pure and crossbred pigs. Nig. J. Anim. Prod., 6: 26-32.

Adebambo, A.O., 1981. Comparison of the indigenous and exotic pure and crossbreed sows in Southern Nigeria: Relationship dam and litter performance. Nig. J. Anim. Prod., 8: 67-74.

Adebambo, A.O., 1983. Comparative growth and carcass performance of progenies sired by purebred Large White and Hampshire boars and their crosses with the Nigerian local breed. Nig. J. Anim. Prod., 10: 124-129.

Benjamin, M.M., 1961. Veterinary Clinical Pathology. 2nd Edn., Iowa State University Press, Ames, Iowa, USA.

Cameron, C.W. and G.C. Ashton, 1969. The local black and Large White breeds of pigs for meat production in Ghana. Legon J. Agric., 2: 19-22.

Codjo, A.B., 2003. Estimation of the energy requirement of Benin indigenous pigs during growing period from 7 to 22 kg live weight. Tropicultura, 21: 56-60.

FAO, 1992. Meat and meat products in animal nutrition in developing countries. Food and Nutrition Paper 53, Food and Agriculture Organization, Rome.

FAO, 1998. Statistical database. http://www.faostat.Fao.org/default.html.

Fetuga, B.L., G.M. Babatunde and V.A. Oyenuga, 1976. Performance of the indigenous pigs of Nigeria under intensive management condition. Nig. J. Anim. Prod., 3: 148-161.

Fetuga, B.L., G.M. Babatunde, E.O. Olabisi, and V.A. Oyenuga, 1977. Comparative response of Large White, Landrace and the indigenous Nigerian pigs to diets of varying protein concentrations. Nig. J. Anim. Prod., 4: 181-204.

Greenwood, P.L., R.M. Slepetis and A.W. Bell, 2000. Influence of fetal and Placental weights during mid to late gestation in prolific ewes well nourished throughout pregnancy. Reprod. Fert. Dev., 12: 149-156.

Iliori, J.O., 1974. Assessing the productive potentials of local breeds of pigs: I. Effect of protein levels on performance. Nig. J. Anim. Prod., 1: 27-34.

Ilori, J.O. and A. Adepoju, 1980. The effect of varying dietary proteins and antibiotics levels on the performance of weanling local pigs. Ife J. Agric., 2: 34-42.

Ilori, J.O., 1984. The effect of dietary proteins and Palm oil on performance, age and weight at puberty of indigenous pigs in Nigeria. Ife J. Agric., 6: 54-64.

Jain, N.C., 1986. Schalm's Veterinary Hematology. 4th Edn., Lea and Febigir, Philadelphia.

Kaneko, J.J., 1980. Clinical Biochemistry of Domestic Animals. 4th Edn. Academy Press, New York.

Little, T.M. and J.F. Hills, 1978. Agriculture Experimentation: Design and Analysis. John Wiley and Sons, London UK.

Okeudo, N.J., I.C. Okoli and G.O.F. Igwe, 2003. Haematological characteristics of ducks (*Cairina moschata*) of Southeastern Nigeria. Tropicultura, 21: 61-65.

Orji, B.I., G.C. Okeke and A.O. Akunyiba, 1986. Hematological studies of the guinea fowl (*Numida meleagris* Pallas): 1. Effect of age, sex and time of bleeding on the haematological values of guinea fowls. Nig. J. Anim. Prod., 13: 94-99.

Pallson, H., 1955. Progress in the Physiology of Farm Animals. Hammond, J. (Ed.), Vol. 2, Butterworth, London, pp: 430.

Radositis, O.M., D.C. Blood and C.C. Gay, 1994. Veterinary Medicine: A Textbook of Diseases of Cattle, Sheep, Pigs, Goats and Horses. W.B. Saunders Company, London.

Sarin, L.H., S.R. Lopez, E.T. Olivares, M.C. Terrazas, M.A.R. Silva and M.L. Carillo, 2001. Relationship between birth weight and placenta weight. Biol. Neonate, 80: 113-117.

Umesiobi, D.O., 2000. Animal Production 2: Ruminant and Non Ruminant Practicum. Bean Blaise Publication, Owerri, Nigeria.

Vohdrasky, F., 1968. The productive of Large White and local black sows in pure breeding and reciprocal crossing. Legon J. Agric., 1: 68-72.

WHO, 1985. Energy and protein requirements. Report of a Joint FAO/WHO/UNU Expert Consultation, Rome, 5 October 1981. WHO Technical Report Series, No. 724. Geneva.