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Full Length Research Paper

Body weight and carcass traits of F_1 pigs produced by ASF- recovered pigs

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Data on the serological test, pre-weaning weekly body weight, pre-weaning mortality and carcass characteristics from fifty-two pigs generated from eight sows and two boars, (4 Large White sows, 2 Large Black sows, 2 Duroc sows, 1 Large White boar and 1 NigerHyb boar: survivors of the African Swine Fever (ASF) outbreak in a farm at Abeokuta, Nigeria, in 2005) were evaluated. Data obtained were subjected to General Linear Model (GLM) procedure. The serological test for determining the presence of ASF antibody showed that all the ASF recovered pigs tested positive while 18.79% of the F_1 tested positive. There was no sex effect ($P > 0.05$) on the pre-weaning weekly body weight of piglets farrowed by the two groups. Similarly, no significant effects on the pre-weaning weekly body weight among the genotypes farrowed by pigs of low titre values of ASF antibody. Genotypic effects on the carcass traits were significant ($P < 0.05$) on spleen and lung weight of the F_1 while effect of sex was significant on live weight, lung weight, kidney weight, stomach weight, liver weight and hind leg weight. The use of recovered and infected pigs in breeding is recommended, in as much as the disease is not zoonotic and the productivity of the pigs were comparable with those reported before the out-break of ASF.

Key words: African Swine Fever (ASF) recovered pigs, carcass traits, body weight, serological test.

INTRODUCTION

In the world, there is no doubt that the solution to animal protein shortage rests in the promotion and more efficient production of all classes of meat animals including swine. Pig (*Sus scrofa*) is one of the sources of animal protein. It represents one of the fastest ways of increasing animal protein since pigs grow at a fast rate and are highly more prolific than cattle, sheep and goat (Ikani and Dafwang, 1995).

The state of health of an animal plays a major role in its production either in the form of food conversion to put on flesh or in the production of milk and young ones. Abubakar et al. (2003) reported that among the factors that affect livestock production in Nigeria is disease. Among the diseases of pigs that pose a great threat to the pig industry is African Swine Fever (ASF). The disease is a virus disease, it has no known treatment or vaccine and it is characterized by 85-100% mortality with any recovered pig potentially acting as carrier of infection.

Growth performance is an important characteristic in animal production and it determines the rate of progress made most especially in pig production. An understanding of carcass proportions and conformity would be valuable in any attempt at modifying types of meat produced. Information on both physical and chemical characteristics of carcass of several European breeds of pig and indigenous pigs are available in literature (Sofoluke and Dettmers, 1973; Modubuiku, 1984; Sikka, 2006; Sikka, 2007). However, there is dearth of information on growth performance of pigs produced by ASF- recovered pigs. Therefore, this project is designed to provide information on body weight and carcass characteristics of F_1 pigs produced by ASF-recovered pigs.

MATERIALS AND METHODS

This study was carried out at the Piggery Unit, Teaching and Research Farm, University of Agriculture, Abeokuta, Ogun State, Nigeria. The area is situated in the derived savannah vegetation zone.

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Table 1. Differential diagnosis of pig sera.

Animals	Number tested	Number positive	Number negative	Number undecided	Total
Foundation stock	10	10	-	-	10
F_1	32	6 (18.75%)	18 (56.25%)	8 (25%)	32
Total	42	16	18	8	42

Table 2. Effect of sex on weekly body weight of F_1 piglets produced by pigs with high titre values of ASF antibody.

Week	Male (kg)	N	Female (kg)	N	Overall	N
1	2.19 ± 0.17	13	2.10 ± 0.18	11	2.15 ± 0.12	24
2	3.03 ± 0.24	12	2.95 ± 0.23	11	2.99 ± 0.16	23
3	3.67 ± 0.26	12	3.55 ± 0.26	11	3.61 ± 0.18	23
4	4.36 ± 0.31	12	4.10 ± 0.34	11	4.23 ± 0.22	23
5	5.01 ± 0.39	12	4.65 ± 0.42	11	4.83 ± 0.28	23
6	5.87 ± 0.44	12	5.69 ± 0.52	11	5.78 ± 0.33	23
7	6.43 ± 0.46	12	6.25 ± 0.56	11	6.34 ± 0.35	23
8	7.13 ± 0.53	12	7.07 ± 0.62	10	7.10 ± 0.39	22
Pre-weaning mortality %	7.7		16.7		12	

The breeding stocks were ASF- recovered pigs comprising group A (four Large White sows and one Large White boar with high titre value of ASF antibody (≥ 0.05) and group B (Two Large Black sow, two Duroc sow and one NigerHyb boar with low titre value of ASF antibody (≤ 0.05). The sows were on third parity. The husbandry system was intensive. The animals were housed in pens throughout the study; feed and water were given to the animals based on their physiological condition. Breeding was carried out within each group and piglets were reared for 5-6 months when a male and female were selected from each sow for carcass analysis. Medications were administered when required and serological test was carried out on the breeding stock and the offspring.

Mating designs

The following was used for the mating designs:

LW × LW = LW LW

NH × LB = LBNH

NH × D = DNH

where: LW - Large White; LB - Large Black; D - Duroc; and NH - Nigerhyb.

Data collection

Data were collected on ASF status of the breeding stock of their offspring, pre-weaning weekly body weight of the offspring, pre-weaning mortality and the carcass characteristic of the offspring. The data collected were subjected to General Linear Model analysis of variance procedure (PROCGLM) to compare group means. New Duncan multiple range test was used in separating the means that differed significantly.

The statistical model used was:

$Y_{ijk} = \mu + B_j + S_k + \varepsilon_{ijk;}$

y_{ijk} = observations on the parameters;

μ = universal means;

B_j = effect of genotype;

S_k = effect of sex;

ε_{ijk} = experimental error.

RESULTS

Presence of ASF antibody in ASF- recovered pigs and their offspring

The serological test (Table 1) carried out shows that the ten animals that survived the ASF outbreak tested positive while 18.75% of the offspring tested positive.

Effects of genotype and sex on pre-weaning weekly body weight

The least squares means of pre-weaning weekly body weight of piglets produced by parents of high titre value of ASF antibody and low titre value as influenced by sex and genotype are presented in Tables 2 and 3.

There were no significant ($P > 0.05$) differences between the pre-weaning weekly body weight of male

Table 3. Effect of genotype and sex on weekly body weight (kg) of F_1 piglets produced by pigs with low titre values of ASF antibody.

Week	NHLB	N	NHD	N	Male	N	Female	N	Overall	N
1	2.49 ± 0.17	14	2.09 ± 0.18	12	2.33 ± 0.18	12	2.29 ± 0.19	14	2.31 ± 0.13	26
2	3.43 ± 0.25	14	3.04 ± 0.27	10	3.20 ± 0.25	12	3.33 ± 0.28	12	3.27 ± 0.18	24
3	3.84 ± 0.25	14	3.54 ± 0.26	9	3.58 ± 0.26	12	3.87 ± 0.25	11	3.72 ± 0.18	23
4	4.16 ± 0.24	14	4.27 ± 0.41	9	4.14 ± 0.33	12	4.27 ± 0.28	11	4.20 ± 0.21	23
5	4.61 ± 0.24	14	4.78 ± 0.49	9	4.69 ± 0.38	12	4.66 ± 0.29	11	4.68 ± 0.24	23
6	5.11 ± 0.23	14	5.17 ± 0.54	9	5.15 ± 0.37	12	5.11 ± 0.33	11	5.13 ± 0.25	23
7	5.59 ± 0.22	14	5.49 ± 0.51	9	5.53 ± 0.37	12	5.57 ± 0.29	11	5.55 ± 0.23	23
8	5.99 ± 0.23	14	5.94 ± 0.54	9	5.9 ± 0.38	12	6.04 ± 0.31	11	5.97 ± 0.25	23
Pre-weaning mortality %	0		30.8		0		26.7		14.8	

and female piglets in the two groups and percent mortality was higher in female compared to male in both groups. Effect of genotype was not significant ($p > 0.05$) on the pre-weaning body weight of the piglets farrowed by pigs with low titre value of ASF antibody throughout the eight weeks.

Effects of genotype and sex on carcass characteristics of F_1 pigs

The least square means presented in Table 4 revealed the effect of genotype and sex on carcass traits of F_1 pigs. The differences among the values of spleen weight and lung weight across the genotypes were significant ($p<0.05$). The lung weight of 0.58 ± 0.03 kg recorded for the cross between NigerHyb and Large Black (NHLB) was higher than 0.43 ± 0.05 kg recorded for the cross between NigerHyb and Duroc (NHD). More so, 0.55 ± 0.04 kg recorded for the cross between purebred Large White was significantly higher than 0.43 ± 0.05 kg of NHD. The weights of spleen were 0.12 ± 0.04 kg, 0.15 ± 0.02 kg and 0.10 ± 0.01 kg for LW, NHLB and NHD, respectively. The three values were significantly different from each other. Genotype did not have significant effect on all other carcass traits considered.

Sex effect on virtually all the carcass traits were not significant except for live weight, liver weight, lung weight, kidney weight, stomach weight and hind leg weight. The live weight of male was significantly higher than that of female. The liver weight of male was 1.04 ± 0.03 kg which was significantly different ($p < 0.05$) from 0.90 ± 0.04 kg recorded for female. Estimates of 0.59 ± 0.03 kg and 0.46 ± 0.03 kg were recorded for male and female lung weights, respectively. The kidney weight of the male (0.23 ± 0.02 kg) was significantly higher than that of female (0.16 ± 0.02 kg), while the stomach weight of the female (1.70 ± 0.17 kg) was significantly different from that of male (1.13 ± 0.19 kg). The hind leg weight of male pig (1.00 ± 0.02 kg) was higher than that of the female (0.85 ± 0.06 kg). The live weight of male pig (55.13 ± 1.25 kg) was significantly higher than that of the female (51.56 ± 0.26).

DISCUSSION

The serological test showed a decline in the number of pigs infected with ASF from 100% in recovered pigs to 18.79% in the F_1 pigs. This indicates a decrease in the shedding of the virus from the recovered pigs into the environment and subsequently, a reduction in the prevailing rate of exposure of other pigs to the virus within the environment. This is expected because macrophages and mast cells trap the virus within the tissue of infected pigs, resulting into reduction in the amount of live virus that are shed into the environment through urine and faeces.

The result of this present study revealed that pre-weaning weekly body weight measurements of the progenies of pigs with high titre values of ASF antibody and those from low titre values of ASF antibody were not affected by sex; though male progenies weighed more than the female almost throughout the eight weeks of rearing. This indicates sexual dimorphism. The progressive increase in the pre-weaning weekly body weight in both sexes agrees with the findings of Okon et al. (2008). Also, Eusebio (1988) reported that growth during the pre-weaning stage was rapid as body cells were multiplying fast. The non-significant effect of sex on the weekly body weight was contrary to the findings of Laseinde and Oluyemi (1996) who observed significant differences in the body weights of male and female ducks. The pre-weaning mortality in males and females observed in this study revealed that more females died as compared to males. This was contrary to the findings of several authors (Becker, 1995; Svendsen et al., 1986; Knol et al., 2002). Becker (1995) reported that the increased mortality in males was due to more males being crushed and to chilling. Although the underlying mechanism responsible for this sexual dimorphism in pre-weaning mortality has not been elucidated, the reason for the observed mortality in this study may be due to the ability of the males to compete more favourably for milk and

Table 4. Effects of genotype and sex on carcass characteristics of F_1 pigs.

Parameter	Genotype						Sex					
	LW	N	NHLB	N	NHD	N	Male	N	Female	N	Overall	N
Live wt (kg)	52.93 ± 0.89[a]	8	53.5 ± 2.21[a]	4	54.00 ± 1.73[a]	4	55.13 ± 1.25[a]	8	51.56 ± 0.26[b]	8	53.34 ± 0.77	16
Carcass wt (kg)	38.46 ± 0.73[a]	8	37.25 ± 1.71[a]	4	38.13 ± 0.82[a]	4	39.24 ± 0.84[a]	8	36.91 ± 0.533[a]	8	38.08 ± 0.57	16
Dressing %	72.66 ± 0.78[a]	8	69.6 ± 1.21[a]	4	70.65 ± 1.04[a]	4	71.21 ± 0.73[a]	8	71.57 ± 1.10[a]	8	71.39 ± 0.62	16
Backfat (cm)	2.88 ± 0.09[a]	8	2.93 ± 0.18[a]	4	3.03 ± 0.08[a]	4	2.94 ± 0.08[a]	8	2.91 ± 0.10[a]	8	2.93 ± 0.06	16
Head wt (kg)	5.74 ± 0.17[a]	8	5.45 ± 0.33[a]	4	6.13 ± 0.28[a]	4	5.91 ± 0.27[a]	8	5.61 ± 0.05[a]	8	5.76 ± 0.14	16
Leg wt (kg)	1.54 ± 0.05[a]	8	1.69 ± 0.07[a]	4	1.51 ± 0.12[a]	4	1.64 ± 0.03[a]	8	1.50 ± 0.08[a]	8	1.57 ± 0.04	16
Liver wt (kg) %	0.99 ± 0.03[a] (1.87)	8	1.00 ± 0.07[a] (1.87)	4	0.89 ± 0.04[a] (1.65)	4	1.04 ± 0.03[a] (1.89)	8	0.90 ± 0.04[b] (1.75)	8	0.97 ± 0.03 (1.82)	16
Lung wt (kg) %	0.55 ± 0.04[a] (1.04)	8	0.58 ±0.03[a] (1.08)	4	0.43 ± 0.05[b] (0.79)	4	0.59 ± 0.03[a] (1.07)	8	0.46 ± 0.03[b] (0.89)	8	0.53 ± 0.03 (0.99)	16
Kidney wt (kg) %	0.19 ± 0.02[a] (0.35)	8	0.23 ± 0.03[a] (0.43)	4	0.17 ± 0.04[a] (0.31)	4	0.23 ± 0.02[a] (0.42)	8	0.16 ± 0.02[b] (0.31)	8	0.19 ± 0.02 (0.36)	16
Spleen wt (kg) %	0.12 ± 0.01[b] (0.23)	8	0.15 ± 0.02[a] (0.28)	4	0.10 ± 0[b] (0.19)	4	0.11 ± 0.008[a] (0.19)	8	0.13 ± 0.01[a] (0.25)	8	0.12 ± 0.007 (0.22)	16
Heart wt (kg) %	0.21 ± 0.006[a] (0.39)	8	0.26 ± 0.02[a] (0.48)	4	0.21 ± 0.03[a] (0.39)	4	0.24 ± 0.02[a] (0.44)	8	0.21 ± 0.01[a] (0.41)	8	0.22 ± 0.01 (0.41)	16
Stomach wt (kg) %	1.53 ± 0.23[a] (2.89)	8	1.27 ± 0.31[a] (2.37)	4	1.32 ± 0.20[a] (2.44)	4	1.13 ± 0.19[a] (2.05)	8	1.70 ± 0.17[b] (3.29)	8	1.42 ± 0.14 (2.66)	16
Ept St wt (kg) %	0.57 ± 0.03[a] (1.08)	8	0.63 ± 0.03[a] (1.17)	4	0.56 ± 0.02[a] (1.04)	4	0.55 ± 0.02[a] (0.99)	8	0.61 ± 0.02[a] (1.18)	8	0.58 ± 0.02 (1.08)	16
SI wt (kg) %	1.46 ± 0.08[a] (2.76)	8	1.42 ± 0.13[a] (2.65)	4	1.38 ± 0.11[a] (2.56)	4	1.37 ± 0.07[a] (2.48)	8	1.49 ± 0.08[a] (2.88)	8	1.43 ± 0.06 (2.68)	16
LI wt (kg) %	2.45 ± 0.15[a] (4.63)	8	2.40 ± 0.27[a] (4.49)	4	2.48 ± 0.24[a] (4.59)	4	2.28 ± 0.16[a] (4.14)	8	2.61 ± 0.13[a] (5.06)	8	2.44 ± 0.11 (4.57)	16
Intestine wt (kg) %	3.91 ± 0.21[a] (7.38)	8	3.83 ± 0.15[a] (7.16)	4	3.85 ± 0.29[a] (7.13)	4	3.65 ± 0.18[a] (6.62)	8	4.10 ± 0.15[a] (7.9)	8	3.88 ± 0.12 (7.27)	16
Ept Siw (kg) %	0.91 ± 0.04[a] (1.72)	8	0.93 ± 0.08[a] (1.74)	4	0.93 ± 0.05[a] (1.72)	4	0.95 ± 0.05[a] (1.72)	8	0.87 ± 0.04[a] (1.69)	8	0.92 ± 0.03 (1.72)	16
Ept LI wt (kg) %	0.88 ± 0.06[a] (1.66)	8	0.96 ± 0.10[a] (1.79)	4	1.10 ± 0.08[a] (2.03)	4	0.91 ± 0.05[a] (1.65)	8	0.98 ± 0.07[a] (1.9)	8	0.95 ± 0.05 (1.78)	16
Loin eye area (cm)	25.44 ± 0.47[a]	8	25.75 ± 1.46[a]	4	25.55 ± 0.61[a]	4	26.24 ± 0.64[a]	8	24.85 ± 0.45[a]	8	25.5 ± 0.42	16
Uterus (kg) %	0.76 ± 0.06[a] (1.44)	8	0.70 ± 0.2[a] (1.31)	4	0.50 ± 0.05[a] (0.93)	4	-	8	0.68 ± 0.06[a] (1.32)	8	0.68 ± 0.06 (1.27)	16
Testis (kg) %	0.55 ± 0.02[a] (1.04)	8	0.57 ± 0.08[a] (1.07)	4	0.60 ± 0.00[a] (1.11)	4	0.57 ± 0.02[a] (1.03)	8	-	8	0.57 ± 0.02 (1.07)	16
Foreleg wt (kg)	0.65 ± 0.01[a]	8	0.68 ± 0.04[a]	4	0.59 ± 0.07[a]	4	0.63 ± 0.01[a]	8	0.65 ± 0.04[a]	8	0.64 ± 0.02	16
Hind leg wt (kg)	0.89 ± 0.06[a]	8	1.01 ± 0.06[a]	4	0.90 ± 0.06[a]	4	1.00 ± 0.02[a]	8	0.85 ± 0.06[b]	8	0.93 ± 0.04	16

a, b: means in the same row with different superscripts are significantly different ($p<0.05$); ns: not significant.

feed than their female counterparts, together with more crushing of females than males by the dam. Effects of genotype on the weekly body weights of F_1 progenies produced by pigs with low titre values of ASF antibody were not significant throughout the eight weeks. This may be that the dams, Large Black and Duroc were not significantly different in their nursing ability.

The results of this study revealed that genotype had no significant effect on most of the carcass traits considered among F_1 pigs except on lung weight, and spleen weight. This indicated that even though the pigs were produced by parents at different levels of ASF antibody, most of the carcass characteristics were not significantly different. The values observed for the traits among the genotypes can be compared with the reports of earlier researchers (Sofoluke and Dettmers, 1973; Babatunde and Oyenuga, 1975; Babatunde et al., 1975; Fetuga et al., 1976; Madubuike, 1984; Sikka, 2006; Skka, 2007). The significant effect observed in spleen weight might be due to the fact that the spleen is one of the organs affected by ASF virus (Minguez et al., 1988). The effects of sex on carcass traits were significant on live weight, lung weight, liver weight, kidney weight, stomach weight and hind leg weight. The significant difference observed on live weight indicates that between 5 and 6 months of age, male pigs weighed higher than female pigs. This indicates sexual dimorphism. The significant differences in liver weight, lung weight and kidney weight may be in response to higher live weight observed in males because these traits have higher values in males compared to females. The full stomach weight of males was significantly lower than that of females, which may be as a result of the fact that females consumed more feed than the males or digestibility was higher in males compared to females. However, the hind leg weight of males was higher than that of females, which may be due to higher live weight observed in males.

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