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Original article

Hematological and carcass characteristics of crossbred local and large white pigs fed with graded levels of chicken and fish viscera as feed supplement

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ABSTRACT

The study aimed to evaluate the effect of chicken and fish viscera used as feed supplement in pigs on fattening. Ninety crossbreed (Local x Large White) weaned pigs of 12 weeks old, weighing on average 9.5kg were divided into five groups of eighteen. Each group was assigned to one of the five diets contained 0% (control), 0, 1.5, 3.5 and 5% of chicken viscera and respectively 0% (control), 5, 3.5, 1.5 and 0% of fish viscera for 90 days. Haematological parameters like Packed cell volume (PCV), Haemoglobin (Hb), Red blood cell (RBC), White blood cell (WBC), Mean corpuscular haemoglobin (MCH), Mean corpuscular haemoglobin concentration (MCHC) and Mean corpuscular volume (MCV) were studied. After 90 days of rearing, four pigs from each group were slaughtered for carcass trait analysis. Offal and carcass weights and carcass length were recorded. Results showed that the haematological parameters weren't different (P>0.05) among treatments. The RBC and WBC of the control group A0 was higher than those of dietary treatments and the standard value. In addition some value of platelets were lower than the minimum value adapted

from Coronado 2014.

1. Introduction

Archeological evidence, including stone tools and butchery marks on fossilized bones, suggest that early hominis adapted to an omnivorous diet more than 2.6 million years ago, supplementing their plant-based diets of fruits, seeds and tubers with the meat and marrow from various wild animals (Pobiner, 2013). For some time past, a lot of research questions were focused on meat production and processing and had array of topics from traditional meat sources to specialty meats, including culinary arts and meat (Moss, 2012), composition (De Smet, 2012), proteomic applications (Picard et al., 2012), dry-cured ham (Rentfrowet al., 2012), Jinhua ham (Zhou et al., 2012). Hanwoo beef (Jo et al., 2012), game meat (Hoffman and Cawthom, 2012), and artisan beef (Oliver, 2012).

Meat is an important source of high quality food proteins, with increased other hand, selection of specific traits in animals has resulted in meat with specific desired palatability for production of wagyu beef, highly prized for its tenderness and flavor.Hoffman and Cawthorn (2013) highlighted than an increasing demand for animal proteins in the 21st century, primarily fueled by an ever-growing human population and improving living standards, cannot be solely by conventional livestock.

The current demand for meat is at an all-time high, driven predominantly by the developing world, where increasing populations, urbanization and greater incomes have promoted the increased inclusion of animal proteins in the diet (Thornton, 2010). Pork is comparatively cheap source of animal protein of high biological value. The other animal source foods such as goat, beef and chicken alone cannot meet the protein requirements of the growing population. In a lot of developing countries, pig are fed with conventional cereal grains and hence, there is a need to export alternative nutritive feed resources which are locally available. The fish and chicken viscera appears to be considered as potential source of nutriments and has a considerably high feeding value as it contains almost all essential amino acids and minerals such. But very little information is available about the use of fish and chicken viscera in pig diets. Hence this study was planned to determine the effect of incorporation of fish and chicken viscera in pig diets as a protein replacer on the hematological and carcass parameters of crossbred local and large white pigs.

2. Materials and methods

A feeding trial was conducted using 90 Large white x Local pigs with initial live weight of 09.50 ± 0.5 kg for a period of 90 days. The pigs were randomly divided into five experimental groups with 18 pigs in each group such that the group average weights were uniform. Five rations A0 (conventional), A1, A2, A3 and A4 (test rations) were prepared and fed to animals (Table 1).

Haematological studies were carried out by collecting blood from experimental animals at the 7th day of the end of an experiment. Pigs were restrained properly on the floor and blood samples were collected from the anterior vena cava of four pigs of each experimental group in the sample bottles containing Ethylene-diamine-tetra-acetic-acid (EDTA) for haematological evaluation. After collection, the samples were transferred for analysis. Analysis was done by using the hematology analyzer auto analyzer PE-6800. Procan Electronics Inc. China.Haematological parameters like Packed cell volume (PCV), Haemoglobin (Hb), Red blood cell (RBC), White blood cell (WBC), Mean corpuscular haemoglobin (MCH), Mean corpuscular haemoglobin concentration (MCHC) and Mean corpuscular volume (MCV) were studied.

After the study completion at 90 days, four pigs from each group were identified for carcass trait analysis. Identified pigs were fasted for 24 hours then slaughtered. After evisceration, the carcasses were cleaned thoroughly with running tap water and the water was allowed to drain by hanging the carcasses. Carcass length was measured from the forward edge of the first rib to the forward edge of the aitch bone using measuring tape. Weights of totals offal and carcass weight were recorded.

Table 1
Composition of experimental diets.

	Experimental diet				
Ingredients (%)	**A0**	**A1**	**A2**	**A3**	**A4**
Maize	29				
Wheat bran	24.65				
Palm kernel cake	32.5				
Cotton seed cake	5				
Fish meal	5				
Shell	1.5				
C5	1.5				
Phosphate	0.5				
Sulfate	0.05				
Salt	0.3				
Azolla		40	40	40	40
Moringa		25	25	25	25
Rice bran		30	30	30	30
Chickenviscera		0	1.5	3.5	5
Fish viscera		5	3.5	1.5	0
Total	100	100	100	100	100
Nutritional composition					
DM					
Ether extract %	9.71	5.3	5.56	5.89	6.16
Crudeprotein (%)	19.8	18.74	18	19.59	19.95
Crudefiber (%)	17.31	18.41	18.41	18.41	18.41
Metabolizableenergy	2603.83	2210.69	2151.8	2283.3	2314.44

2.1. Statistical analysis

The data collected on the meat quality traits of the different group were analysed with the software SAS (Statistical Analysis System. 2009). For the analysis of variance, a fixed effects linear model was adjusted to the data and includes the fixed effects of the diet. The F test was used to determine the significance level of each effect in the model. Means were compared two by two by the Student's t test.

3. Results

3.1. Haematological parameters

The haematological parameters (PCV, Hb, RBC, WBC, MCV, MCHC, PN, PE, Mono, Lym, Plt) observed showed no significant difference (P>0.05) among treatments. The RBC and WBC value of pig batch the control diet A0 was higher than those of dietary treatments and the standard value, whereas no difference (P>0.05) was observed about these parameters. In addition some value of platelets were lower than the minimum value adapted from Coronado 2014, however no significant difference between of effect of different dietary treatment (Table 2).

3.2. Carcass characteristics

After the study completion at 90 days, four pigs from each group were identified for carcass trait analysis. Identified pigs were fasted for 24 hours then slaughtered. After evisceration, the carcasses were cleaned thoroughly with running tap water and the water was allowed to drain by hanging the carcasses. Carcass length was measured from the forward edge of the first rib to the forward edge of the aitch bone using measuring tape. Weights of totals offal were recorded and carcass weight. The carcass traits after the study completion are presented in table 3.

Table 2
Hematological parameters of experimental pig.

Parameters	Range of value	A0	A1	A2	A3	A4	Probability
RBC ($X10^6$)	5.0-8.0	8.3 ± 0.6[a]	7.6 ± 0.3[a]	7.3± 0.2[a]	7 ± 0.4[a]	6.8 ± 0.4[a]	P > 0.05
Hb (g/dL)	10.0-16.0	13.1 ± 0.9[a]	12.5 ± 0.5[a]	11.7± 0.6[a]	11.4 ± 0.8[a]	11.2 ± 0.4[a]	P > 0.05
PCV (%)	32.0-50.0	48.4 ± 2.3[a]	46.6 ± 1[a]	43.6± 1.5[a]	42.8 ± 2.6[a]	43.8 ± 1.9[a]	P > 0.05
VGM	50.0 - 56.0	58.6 ± 1.9	61.8 ± 2.2	59.9± 0.9	61.4 ± 2.4	64.8 ± 2.4	P > 0.05
TCMH	16.0 - 19.0	15.9 ± 0.6	16.5 ± 1	16± 0.5	16.3 ± 0.7	16.7 ± 0.6	P > 0.05
MCHC (g/dL)	25.0 - 36.0	27 ± 0.6[a]	26.7 ± 0.7[a]	26.8± 0.6[a]	26.5 ± 0.3[a]	25.7 ± 0.3[a]	P > 0.05
Platelets (X1000)	325 – 715	274.7 ± 123.3[a]	187.3 ± 30.7[a]	315.7± 77.6[a]	403 ± 9[a]	166.3 ± 29.5[a]	P > 0.05
WBC ($X10^3$)	11.0 - 22.0	24.4 ± 4[a]	14.7 ± 2.4[a]	14.9± 1.4[a]	15.7 ± 1.7[a]	15.2 ± 2.9[a]	P > 0.05
PN	28.0 - 51.0	43.5 ± 7.9[a]	36.8 ± 3.3[a]	41± 3.4[a]	32.3 ± 3.1[a]	30.8 ± 7.6[a]	P > 0.05
PE	0.5 - 11.0	1 ± 1[b]	3.3 ± 0.3[ab]	4.5± 0.9[a]	2.3 ± 0.5[ab]	1.8 ± 0.5[b]	P < 0.05
Mono	2.0 - 10.0	1.3 ± 1.3[a]	3.5 ± 0.3[a]	3.3± 0.8[a]	3 ± 0.6[a]	1.7 ± 0.7[a]	P > 0.05
Lym	39.0 - 62.0	57.3 ± 4.5[a]	58 ± 2[a]	51.8± 4.9[a]	63.3 ± 2.2[a]	65.8 ± 8.1[a]	P > 0.05

Table 3
Carcass traits of crossbred pigs under different feeding regimes.

Parameters	Experimentaldiets					Probability
	A0	A1	A2	A3	A4	
Carcassyield (%)	55.12 ± 2.7[a]	50.2 ± 2.04[b]	54.45 1.3[ab]	53.31 ± 2.08[ab]	53.43 ±2.3[ab]	P > 0.05
Carcasslength (Cm)	64 ± 6.4[a]	56 ± 4.3[ab]	59.75 ±3.9[ab]	52.75 ± 4.1[b]	54.25 ± 4.3[b]	P < 0.05
Total offal (Kg)	5.4 ± 0.5[a]	3.9 ± 0.5[b]	4.2 ± 0.9[b]	3.7 ± 0.15[b]	3.9± 0.6[b]	P < 0.05

There was no significant difference among the pigs fed with different rations for the various carcass parameters such as carcass yield, carcass length and total offal. The carcass yield of pigs was higher respectively in A0 (55.12) and A2 (54.45) followed by A3 pigs (53.31) and A4 pigs (53.43) and lower in A1 (50.02). A higher carcass length was noticed in A0 pigs (64 cm) followed by 59.75, 56, 54.25 and 52.75 cm respectively in A2. A1. A4 and A3. About the total offal, the higher value of total offal was noticed in A0 pigs followed by A1 and A4 (3.9 kg) and respectively 4.2 and 3.7 kg in A2 and A3.

4. Discussion

4.1. Haematological parameters

In medical research, blood is an important index of physiological pathological and nutritional status of organism. As reported by Onyeyiliet al. (1991) and Togunet al. (2009) haematological studies represent as useful process in the diagnostic of many diseases as well as investigation of the extent of damage to blood,Ovuru and Ekwozor (2004) and Issacet al. (2013) stated that haematological studies are of ecological and physiological interest in helping to understand the relationship of blood characteristic and environment. Haematological parameters are those parameters that are related to the blood and blood forming organs (Waugh and Grant, 2001).

As reported by Issacet al, (2013) animals with good blood composition are likely to show good performance. Nutritional level is one of the factors which affect the physiology of animals (Ajao, 2013). Blood values of animals might be influenced by certain factors such as nutrition among others (Schalmet al.,1975).The haematological values recorded at the end of an experiment for all the treatment groups are presented in table 2. The mean haematological values obtained from this study were similar to the reference values as documented by Jain (1993). Moreover, there was no significant (P > 0.05) difference between the PCV, Hb, RBC, WBC and MCHC mean values.The high value recorded for WBC in pigs A0 may not be unconnected to the fact that the pigs, during the

transport were exposed to harsh environmental condition. This increase may be the animal's response to these challenges. The variation in the values obtained when compared with standard may attributed to many parameters as differences in health status of the animals used experimental procedures and breeds of pig sample (Mitrukaet al., 1977). It could be concluded that that the chicken and fish intake had no significant effect on the haematological parameters in pigs.

Similar observations were reported by Alalade et al. (2007) and also by Cherryl et al. (2014) which found that the inclusion of Azolla up to 20% in the diet of the pigs did not seem to have any influence on the hematologic parameters of the latter.The hematologic values obtained in the present study were in agreement with those obtained by Aluet al. (2011) compared to the fibre diet. One could conclude that the high fibre in pig diet did not have any effect on the hematologic parameters of the experimental groups. The hematologic analysis at the end of the experimentation enables us to conclude that the inclusion of Azolla, Moringa and rice bran respectively with 40%, 25%, 30% in the diets of pig did not have any influence on the hematologic parameters of the latter.Further it was observed that, using of unconventional diets of pig helped to obtain pork with less fat percentage when compared to that of pigs fed with conventional concentrates.

4.2. Carcass characteristics

The analysis of obtained results allowed concluding that form the present experiment, there was no significant difference among the means of various traits such as carcass yield, carcass length and total offal of the pigs fed with five different rations (table3). The carcass characteristics of pigs were not affected by different dietary treatments (A0, A1, A2, A3 and A4) (table1).

These observations were similar to that observed by Duran. (1994) in pigs, Becerraet al.(1995) in ducks and Dhumalet al. (2009) in broiler birds.This study results indicated that the chicken and fish viscera could be used as an protein replacement source in pig nutrition without affecting the carcass characteristics of pigs.

5. Conclusion

Nutrition is very important aspect of pig production and may be affects the blood values of pig, but most are ignorant about the nutrient requirements of pigs. Report by different researchers have revealed that different diets have diverse effects; either positive or negative effects on the blood parameters and carcass characteristics of pigs. The present study results indicated that the chicken and fish viscera could be used as supplement in pig nutrition without affecting the carcass characteristics and the blood parameters. Moreover, the study has shown that fish and chicken viscera in pig nutrition had no detriment effect on carcass characteristics and the blood parameters of pigs.

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