

## *Haematology of Pigs vs Enzyme-Supplemented PKC*

### **HAEMATOLOGY OF WEANER PIGS FED ENZYME SUPPLEMENTED PALM KERNEL CAKE (PKC).**

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#### **ABSTRACT**

*This study was carried out to evaluate the effect of enzyme supplemented Palm Kernel Cake (PKC) on the haematology of weaner pigs. Thirty large white x duroc crossbreed weaner pigs were randomly allocated to five dietary treatments such that each treatment had six pigs. The five treatments are 0%PKC without enzyme (Control), 40%PKC + Enzyme, 40%PKC Enzyme, 60%PKC +PKC and 60%PKC Enzyme which represented treatments 1, 2, 3, 4 and 5 respectively (the percentage PKC were used as replacement for maize in this study). Each treatment was replicated thrice with two pigs per replicate. This is a completely randomized design (CRD), which lasted for twelve weeks. The experiment was carried out under intensive management system at the Delta State Pig farm. Experimental diets and clean water were provided ad libitum with other standard management practices strictly maintained throughout the experimental period. Within the last week of the feeding trial, one pig each from the replicates was selected at random for bleeding. Blood samples were collected through venepuncture on veins at the backside of the ears. The blood samples were then taken to the laboratory for haematological and biochemistry analysis. Data collected were subjected to analysis of variance. The results showed that the white blood cell (WBC), packed cell volume (PCV) and the Mean Corpuscular Volume (MCV) were not affected by the experimental diets as there were no significant ( $P>0.05$ ) differences between their means. There were however significant ( $P<0.05$ ) differences among the means of other haematological parameters. Generally, this study reveals no deleterious effect on the haematological parameters of the experimental animals. These results therefore indicates that up to 60% Palm kernel cake inclusion with or without enzyme supplementation in replacement for maize in weaner pigs diet are beneficial for pig performance and carcass quality.*

**KEY WORDS: Haematology, Palm kernel Cake, Enzyme, weaner pigs.**

#### **INTRODUCTION**

The continuous increase in the cost of livestock products such as meat, milk, egg in developing countries has continued to make these products unaffordable to consumers especially the vulnerable groups in rural and semi-urban centers and even low-income earners in sub-Saharan Africa. The results of this development include malnutrition, hunger, sicknesses, poverty food insecurity and unsustainable economic growth among others. The main reason for the high cost of livestock products being the high cost of production mostly due to high cost of feeding especially in monogastric animal production. Africa and especially Nigeria is blessed with enormous agricultural and other resources, which are capable of solving the problems of hunger, food insecurity and other economic problems if these resources are properly, and efficiently utilized.

Research and investigations on how to reduce the high cost of feed especially in monogastric animal production has been severally reported (Iyayi *et al*, 2005, Ezieshi *et al*, 2004, Ezieshi and Olomu, 2006, Akpodiete *et al*, 1999, Orusebio, 1985). However, majority of these studies were carried out on poultry. In recent years some poultry Nutritionists has explored the possibility of replacing maize partially or wholly with cassava root meal (Eruvbetine, 2000), Water hyacinth (Dairo, 1997), palm oil slurry (Atteh and Ologbenla, 1993), Sweet potato (Fetuga and Oluyemi, 1976) among others. Most of these new ingredients are not readily available, they require considerable effort and resources to obtain, they are equally useful as human food or

industrial raw materials and they require much processing.

Palm Kernel Cake is the residue obtained after the extraction of palm kernel oil from the seed. Because of the industrial uses and export potentials of Palm Kernel Oil, PKC is easily available in large quantities, it does not constitute food for man and it is not costly. The use of Palm Kernel Cake based diet in pig production therefore is expected to bring about low cost of production as well as increased productivity of the animals as a result of the various advantages of PKC enumerated above. These, among others are the reasons for its choice in this research

According to Ekenyem and Madueke (2007), the use of unconventional sources of feedstuff to feed livestock has effectively moderated the cost of non-ruminant animal production. Some of these feedstuffs are agro by-products and leaves of some legumes and plants. There is thus the need to evaluate the effects of these unconventional feeds on the health status of the livestock. Esonu *et al*, (2001) had stated that haematological constituents reflect the physiological responsiveness of the animals to their internal and external environment, which include feed and feeding.

Results of evaluation of the effects of feeding diets, which contain unconventional feed ingredients on the haematology of monogastric animals, have also been severally reported by McDonald, 1998; Ikhimioya *et al*, 2000; Akpodiete and Okagbare, 2000 and Obasoyo *et al*, 2005 to mention a few. In his work on the evaluation of the effect of feeding different levels of *Dacryodes edulis* on the haematological characteristics of broilers, Bratte and Omeje (2007) reported that *Dacryodes edulis* Seed Meal can safely be used as feed ingredient even up to 60% inclusion in broilers diets. In line with the reasons behind the above mentioned research activities, the present study is therefore necessary to evaluate the effect of feeding diets containing enzyme supplemented PKC on the haematological characteristics of weaner pigs.

## **MATERIALS AND METHODS**

### **Preparation of Experimental Diets**

The feed ingredients that were used in formulating the experimental diets such as maize, PKC, soybean meal etc were purchased from reputable livestock feed company in Benin city and Asaba. However, the enzyme (Hemicell<sup>(R)</sup>) was purchased from Ibadan. The test ingredient PKC, was used with other ingredients at the required proportion for this experiment i.e. for PKC to replace maize at 0%, 40% and 60% levels with or without enzyme supplementation in weaner pigs ration, representing treatments 1, 2, 3, 4 and 5 respectively and with treatment 1 as the control. The Experimental diets (Table 1) were formulated to give 18% protein for weaner pigs.

### **Experimental Animals and their Management**

Thirty weaner pigs of the large white x duroc crossbreed were used for this study. These animals were made available by the piggery unit of the Teaching and Research Farm, Delta State University, Asaba campus where the research was carried out using the intensive pig production unit of the farm. A total number of 15 pens were used. The 30-weaner pigs were allotted randomly into 5 treatment groups of 3 replicates each. Each replicate have 2 pigs thereby giving a total of 6 pigs per treatment group.

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**Table 1: Ingredient composition of the experimental diets**

<u>INGREDIENTS</u>	<u>DIETARY TREATMENTS</u>				
	1	2	3	4	5
Maize	34.17	20.50	20.50	13.67	13.67
PKC	-	13.67	13.67	20.50	20.50
Maize offal	20	20	20	20	20
Cassava peel	15	15	15	15	15
Soybean meal	24.83	24.83	24.83	24.83	24.83
Local fish waste	2.0	2.0	2.0	2.0	2.0
Bone meal	3.0	3.0	3.0	3.0	3.0
Salt	0.5	0.5	0.5	0.5	0.5
Methionine	0.25	0.25	0.25	0.25	0.25
Vit. Mineral premix	0.25	0.25	0.25	0.25	0.25
TOTAL:	100.	100.	100.	100	100.

**\* Vitamin/mineral premix to supply the followings per kg diet;**

*Vitamin A 8,000 iu, Vitamin D3 2,000 iu, Vitamin E 8,000 mg, Vitamin K 3 2,000 mg, Vitamin B1 1,500 mg, Vitamin B2 4,000 mg, Vitamin B6 1,500 mg, Vitamin B12 10 mcg, Niacin 15,500 mg, Panthothenic acid 5,000 mg, Folic acid 500 mg, Biotin 20 mcg, choline chloride 100,000 mg, Magnese 75,000 mg, Zinc 45,000 mg, Iron 20,000 mg, Copper 4,000 mg, Iodine 1,000 mg, Selenium 200 mg, Cobalt 500 mg, Antioxidant 125,000 mg.*

Treatment 1 - 0% PKC and without enzyme - Control.

Treatment 2 - 40% PKC + enzyme,

Treatment 3 - 40% PKC without enzyme,

Treatment 4 - 60% PKC with enzyme and,

Treatment 5 - 60% PKC without enzyme.

### **Blood Sample Collection**

Within the last week of the feeding trial, one pig each from the replicates was selected at random for bleeding. The animals were given only water on the evening preceding the bleeding. The bleeding was done in the morning before feeding. 5ml of blood was obtained through venepuncture on veins at the backside of the ears using sterilized needles and syringes. EDTA bottles containing anticoagulant were used for this exercise. These samples were analyzed at the Animal Science Laboratory Unit of the Department of Animal Science and Fisheries, Delta State University, Asaba Campus and the Medical Diagnostic Laboratory unit of the Federal Medical Centre, Asaba. Parameters that were evaluated include: red blood cell counts (RBC), packed cell volume (PCV), haemoglobin (Hb), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) and total leucocytes (WBC). Data were analysed by one-way analysis of variance according to the methods of Steel and Torrie (1980) and differences in means separated by Duncan's multiple range test (Duncan, 1955)

### **RESULTS.**

The results of the haematological characteristics of the weaner pigs fed the experimental Diets are presented in Table 2. The white blood cell (WBC), packed cell volume (PCV) and the Mean Corpuscular Volume (MCV) of the experimental animals were not affected by the experimental diets as there were no significant ( $P > 0.05$ ) differences between their means. However, there were significant ( $P < 0.05$ ) differences among the means of other haematological parameters that were measured. The results showed that the Red blood cell (RBC) of treatment 4 (60%PKC + Enzyme) was significantly ( $P < 0.05$ ) higher than that of treatments 1, 2, 3 and 5.

In the same vein, the mean haemoglobin (Hb) values were significantly ( $P<0.05$ ) different among the treatment means. Weaner pigs fed dietary treatments 2 and 3 had higher haemoglobin (Hb) concentration than weaner pigs fed other dietary treatments. The Mean Corpuscular Haemoglobin (MCH) values of the weaner pigs were also significantly ( $P<0.05$ ) different among the five treatments. Treatment 3 had a higher ( $P<0.05$ ) mean corpuscular haemoglobin (MCH) value followed by treatment 2, 5, 1 and 4 in decreasing order. The Mean Corpuscular Haemoglobin Concentration (MCHC) of the experimental animals (weaner pigs) were equally significantly ( $P<0.05$ ) different among the treatment means. Weaner pigs fed dietary treatment 3 had a higher ( $P<0.05$ ) Mean Corpuscular Haemoglobin Concentration value and followed by treatments 2, 5, 1 and 4 in decreasing order.

**Table 2. Haematological Characteristics of weaner pigs fed the Experimental diets.**

Parameters	T R E A T M E N T S					SEM
	1	2	3	4	5	
WBC ( $\times 10^3$ )	13.60 <sup>a</sup>	13.40 <sup>a</sup>	13.33 <sup>a</sup>	14.23 <sup>a</sup>	14.47 <sup>a</sup>	0.91
RBC ( $\times 10^6$ )	6.42 <sup>b</sup>	6.53 <sup>b</sup>	6.27 <sup>b</sup>	7.22 <sup>a</sup>	6.30 <sup>b</sup>	0.01
PCV (%)	42.53 <sup>a</sup>	43.20 <sup>a</sup>	43.83 <sup>a</sup>	45.13 <sup>a</sup>	41.97 <sup>a</sup>	0.33
Hb (g/dl)	12.43 <sup>b</sup>	14.13 <sup>a</sup>	14.69 <sup>a</sup>	12.57 <sup>b</sup>	12.77 <sup>b</sup>	0.30
MCH (Pg)	19.44 <sup>bc</sup>	21.71 <sup>ab</sup>	23.44 <sup>a</sup>	17.44 <sup>c</sup>	20.28 <sup>b</sup>	0.61
MCV (%)	66.56	66.16	69.90	62.51	66.62	0.76
MCHC (%)	29.33 <sup>ab</sup>	32.67 <sup>a</sup>	33.33 <sup>a</sup>	28.00 <sup>b</sup>	30.67 <sup>ab</sup>	0.91

<sup>abc.</sup> Mean within rows with different superscripts are significantly ( $P<0.05$ ) different.

WBC = white blood cells count, RBC = Red blood cells count, PCV = packed cell volume, Hb = haemoglobin, MCH = mean corpuscular haemoglobin, MCHC = mean corpuscular haemoglobin concentration.

#### DISCUSSION AND CONCLUSION

The results of the haematological characteristics of the weaner pigs fed diets containing different levels of PKC with or without enzyme supplementation showed no significant ( $P>0.05$ ) effects on some of the parameters measured. The white blood cell (WBC), packed cell volume (PCV) and the Mean Corpuscular Volume (MCV) of the experimental animals were not affected by the experimental diets as there were no significant ( $P>0.05$ ) differences between their means (Table 2). The non significant ( $P>0.05$ ) effect of the experimental diets on the WBC for instance indicates that the experimental diets had no detrimental effects on the immunity of the weaner pigs. This range of WBC obtained in this study is in agreement with the findings of Baker *et al*, (2001) on the normal range of WBC for weaner pigs.

However, there were significant ( $P<0.05$ ) differences among the means of other haematological parameters that were measured. The Red blood cell (RBC) of treatment 4 (60%PKC + Enzyme) was significantly ( $P<0.05$ ) higher than that of treatments 1(0%PKC without Enzyme), 2(40%PKC + Enzyme), 3(40%PKC without Enzyme) and 5(60%PKC without Enzyme). This could be attributed to dietary effect of enzyme supplementation of PKC on the weaner pigs. The high level of RBC observed in this study will increase the oxygen carrying capacity of the blood of the experimental animals. This is an indication that there was a slight improvement in the oxygen carrying capacity of the blood, which shows that there could be a positive effect of enzyme supplementation on the digestibility of nutrients in both ileum and the total tract of the weaner pigs.

The Mean Corpuscular Haemoglobin (MCH) values of the weaner pigs were also significantly ( $P<0.05$ ) different among the five treatments. Treatment 3(40%PKC without Enzyme) had a higher ( $P<0.05$ ) mean corpuscular haemoglobin (MCH) value followed by treatment 2(40%PKC + Enzyme), 5(60%PKC without

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Enzyme), 1(0%PKC without Enzyme) and 4(60%PKC + Enzyme) in decreasing order. Haemoglobin (Hb) had significant effect on the oxygen carrying capacity of weaner pigs. The higher value recorded in this study therefore showed that anabolic and catabolic processes (metabolism) was efficiently and effectively facilitated to aid digestion. These results are in agreement with the findings of Madubuike and Ekenyem (2006), which states that haematology and serum biochemistry assay of livestock, suggests the physiological disposition of the animals to their nutrition.

Enzyme supplemented PKC in weaner pigs ration in this study did not have any detrimental effect on the blood of the weaner pigs. Enzyme supplementation of palm kernel cake (PKC) in diets 2 (40% PKC + enzyme) and 4 (60% PKC + enzyme) gave a similar result in terms of haematological indices as those reported in literature for growing pigs of the same weight range Graham *et al* (1989).

The finding of this present study, which is in agreement with that of earlier researchers cited in this report showed that inclusion of 40% and 60% enzyme supplemented palm kernel cake as replacement for maize in weaner pigs ration had no significant or deleterious effect on nutrient utilization as well as the haematological characteristics of the animals. Therefore, palm kernel cake (PKC) can safely be used as feed ingredients in formulating weaner pigs ration even up to 60% inclusion level.

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