



Original Research Paper

CENSORING THE HAEMATOLOGICAL AND SERUM BIOCHEMISTRY OF GROWING PIGLETS FED ALTERNATIVE ENERGY DIETS

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ABSTRACT

The study assessed the haematological traits/serum biochemistry of growing piglets, placed on alternative energy diets. Thirty-two growing piglets (Large White and Duroc) were used. Experimental animals were assigned to four treatments (1, 2, 3, and 4) in a completely randomized design (CRD). Each treatment group contained four replicates with two pigs per replicate. The control diet (1) had maize as the main energy source while other diets (2, 3, and 4) had palm kernel meal, brewer's dried grain, and wheat offal as alternatives to maize. Growing piglets were unrestricted to experimental diets and water for six weeks. Data obtained revealed that the haematological indices such as packed cell volume (PCV), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC) were significantly ($P < 0.05$) influenced by the dietary energy treatments. The white blood cell (WBC), red blood cell (RBC), and mean corpuscular volume (MCV) were not significantly ($P > 0.05$) affected. Serum protein, creatinine, urea, and glucose, showed no significant ($P > 0.05$) effect while serum albumin, globulin, and cholesterol were significantly ($P < 0.05$) influenced by the energy treatment diets under investigation. However, the values were within the tolerable ranges hence there were no noticeable health hazards arising from these experimental diets.

Keywords: Growing Pigs, energy, feed, haematology and serum.

INTRODUCTION

Pig production in Nigeria is massively gaining popularity as a means of augmenting protein sources from cattle, poultry, goats, sheep, etc. Livestock products contribute about 13 % of the world's consumption of calories (FAO, 2009). The global contribution of pigs is still moderate and its production has tripled over the years only being surpassed by poultry (FAO, 2009). There is an ever-growing need to increase livestock (pig) production if the overwhelming shortage of animal protein must be addressed (Iwegbu *et al.*, 2022). Akinmutimi and Onwukwe (2002) noted that in Nigeria, the need for animal protein sources is more than the production hence, an acute shortage of animal protein is evident in the diet of the citizenry. This problem is compounded by the prevailing high cost of meat and lack of food security. All these necessitated the need to expand the livestock industry of which pig production cannot be overlooked.

Pig is a fast-growing animal, high in protein, highly prolific, high in vitamins and minerals, and capable of bridging the gap of animal protein deficiencies. To achieve cost-effective pig production, there is a need for farmers to source locally for the feeding materials. De Lange *et al.* (2010) and Kim *et al.* (2011) observed that feeding of piglets with by-products of agriculture has been evaluated to indicate improved performance. These agro-based by-products are low cost (cheap), available and not directly consumed by man hence their suitability in feeding/pig production. Igene (2006) reported that pigs can effectively utilize by-products (agro) and kitchen remnants. However, in feeding pigs agro by-products, the farmer must be careful to ensure that feed does not deleteriously affect the haematology and serum counts of the animal. Omoikhoje (2011) stated that variation in the normal haematology of the cell will have a negative effect on the functionalities of the animal body. Corroborating the above, Ojebiyi *et al.* (2007) stated that the health status of the animal is very important and that one of the ways of assessing it is to evaluate the blood quality through haematological studies. An increase in packed cell volume (PCV) otherwise known as haematocrit indicates an increase in blood viscosity which results in distortion of blood flow. On the other hand, low concentration of erythrocytes indicates low blood viscosity which results in an increased blood flow and lowers blood pressure (Frandsen, 1981). This scenario makes it very much imperative to ascertain the haematology and serum biochemical to determine their well-being. This experiment was carried out to assay the haematological traits and serum biochemistry of growing piglets fed alternative dietary energy treatments.

METHODOLOGY

Site of Experiment, Dietary Ingredients and Period

The feeding trial was carried out at the experimental farm of Ambrose Alli University, Ekpoma, Edo State, Nigeria. The university research farm is situated in the vegetative belt of the region having a Longitude of 6.44 °C North and 6.08 °C East. The Average temperature is 29 °C and a wavering humidity range of 68 % to 76 %. The dietary ingredients were sourced at different Animal Feed Shops in Benin City, Edo State. The animals were placed on an intensive feeding period of forty-two days.

Piglets and Design

The experimental animals numbering thirty-two crossbred Large white and Duroc growing piglets had an initial average weight of 20.8 kg and were ten weeks of age. The animals (piglets) were separated into four groups based on their average initial weights and were accordingly allocated to each of the four treatment diets (1, 2, 3, and 4) in a completely randomized design. Eight growing piglets were in each group with four replicates of two (one male and one female).

Before the experimental animals were brought in and subsequent allocation, the farm, and the hutches were thoroughly washed with disinfectants while the surroundings were cleared to ward off poisonous snakes and other predators. An acclimatization period of one week was allowed before actual experimentation using the dietary ingredients. While animals under investigation had their feed two times in day (8 am and 4 pm), water was administered *ad libitum* all through the period of the experiment. The animals were routinely vaccinated, dewormed, and followed by other medications and management practices.

Table 1: Proximate of Experimental Ingredients (%)

Nutrient	PKM	BDG	WO
DM	89.70	89.50	90.00
CP	20.53	22.49	18.74
EE	6.15	6.25	4.35
CF	16.25	21.00	17.00
CA	4.30	4.70	5.80

Amaefule *et al.* (2009)

KEY: DM=Dry matter, CP=Crude protein, EE=Ether extract, CF=Crude fibre, CA=Crude ash, PKM=Palm kernel cake, BDG=Brewer;s dried grains, WO=Wheat offal.

Diet Formulation

The diets consisted of the following energy sources: maize, palm kernel meal (PKM), brewer's dried grain (BDG), and wheat offal (WO). Groundnut cake (GNC) served as the main protein source while other ingredients consisted of bone meal, vitamins/minerals premix, lysine, methionine, and salt. Dietary treatment 1 was used as the control. It (treatment 1) had maize while treatments 2, 3, and 4 had other alternative energy sources on weight for weight formulation pattern. Constant values were used in the inclusion of other ingredients in the respective diets before they were thoroughly mixed.

Data Collection and Analysis

On the last day of the sixth week, two growing piglets per treatment were used for blood collection. Blood samples were collected through the conspicuous ear veins using needles and syringes into ethylene diamine tetra-acetic (EDTA) dipotassium salt labeled bottles for haematological indices assessment. Another segment of blood samples was gathered from the same growing piglets into a heparinized bottle that did not contain ethylene diamine tetra acetic dipotassium salt for the determination of serum biochemicals. Both samples of the animal blood were analyzed as follows; packed cell volume (PCV), red blood cell (RBC), white blood cell (WBC), haemoglobin (Hb), protein, albumin, globulin, creatinine, urea, and cholesterol were determined using improved Neubauer haemocytometer and cynomethaemoglobin methods (Esonu *et al.*, 2001). The mean

Table 2: Diets Composition

Ingredients %	TRT1	TRT 2	TRT 3	TRT4
Maize	45.00	0.00	0.00	0.00
Palm Kernel Meal	0.00	45.00	0.00	0.00
Brewer' Dried Grain	0.00	0.00	45.00	0.00
Wheat Offal	0.00	0.00	0.00	45.00
Cassava	28.70	28.70	28.70	28.70
Groundnut Cake (GNC)	20.00	20.00	20.00	20.00
Blood Meal	3.30	3.30	3.30	3.30
Bone Meal	2.20	2.20	2.20	2.20
Vit/Min Premix	0.25	0.25	0.25	0.25
Lysine	0.15	0.15	0.15	0.15
Methionine	0.15	0.15	0.15	0.15
Salt	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated	21.40	22.97	22.79	21.12
Crude Protein (%):	3062.24	2652.25	2648.02	2644.59
Energy (Kcal/kg)				

TRT 1=Treatment 1, TRT 2=Treatment 2, TRT 3= Treatment 3, TRT 4= Treatment 4.

corpuscular haemoglobin concentration (MCHC), mean corpuscular haemoglobin (MCH), and mean corpuscular volume (MCV) were calculated (Jain, 1986).

Data Analysis

Data generated were analyzed using analysis of variance (ANOVA) while the means were separated by Duncan's Multiple Range Test method as explained by Steel and Torrie (1990).

RESULTS AND DISCUSSION

Table 3: Haematological Traits as Influenced by the Treatment Diets

Parameters	Dietary Treatments				SEM
	1 Maize (Control)	2 PKM	3 BDG	4 WO	
WBC ($\times 10^9/l$)	15.81	15.54	16.12	15.70	0.23
RBC ($\times 10^{12}/l$)	8.62	7.71	8.40	8.27	0.18
PCV (%)	40.31 ^a	39.42 ^b	38.94 ^b	38.88 ^b	0.52
Hb (g/dl)	10.22 ^a	9.51 ^b	9.34 ^{bc}	8.98 ^c	0.19
MCH (p/g)	19.82 ^b	20.31 ^{ab}	21.16 ^a	20.50 ^{ab}	0.46
MCV (g/dl)	62.26 ^a	61.44 ^b	62.11 ^a	62.11 ^a	0.42
MCHC (%)	29.30 ^a	28.80 ^{ab}	27.70 ^b	27.70 ^b	0.25

Means (abc) in the same row with different superscripts are significantly ($P < 0.05$) different.

KEY: WBC=White blood cell, RBC=Red blood cell, PCV=Packed cell volume, Hb=Haemoglobin, MCH=Mean corpuscular haemoglobin, MCV=Mean corpuscular volume, MCHC=Mean corpuscular haemoglobin concentration. SEMJ=Standard error mean.

Ikegwonu and Basir (1976) and Olorede *et al.* (1996) reported that blood highlighted the relevance of blood to life and noted that for any meaningful work to be done on the biology of an animal, detailed blood analysis is of great essence. They further pointed out that any deviation from the normal haematological range will have an adverse effect on the performance and health status of the animal. An increase in white blood cells (WBC) and a significant decrease in red blood cells (RBC) and packed cell volume (PCV) could signal the presence of disease in the animal.

The haematological evaluation of the growing piglets fed the dietary treatments revealed significant ($P < 0.05$) variations across the experimental diets for PCV, Hb, MCHC, MCV, and MCH as shown in Table 2 above while there were no variations ($P > 0.05$) among all the experimental animals for WBC and RBC. Values obtained for the haematological traits were close though there existed significant variations in some parameters. The haematological values obtained from the study fell

within the normal physiological range published by Banerjee (2009). The mean corpuscular volume of treatment 3 which had brewer’s dried grain (BDG) was comparatively the same as the maize-controlled treatment. In the same vein, the value obtained for mean corpuscular haemoglobin concentration for treatment 2 with palm kernel meal (PKM) is statistically the same as dietary treatment 1 (control). The control treatment (maize) proved to be statistically better on packed cell volume (PCV) and haemoglobin (Hb) than other treatment diets.

Table 4: Serum Biochemistry of Growing Pigs Fed Alternative Energy Sources.

Parameter	Treatments				SEM
	1 Maize	2 PKM	3 BDG	4 WO	
Total Protein (g/dl)	8.51	7.84	7.61	7.68	0.16
Albumin (g/dl)	3.51 ^a	2.92 ^{ab}	2.81 ^b	2.92 ^{ab}	0.12
Globulin (g/dl)	4.99 ^a	4.99 ^a	4.80 ^{ab}	4.66 ^b	0.06
Creatinine (mg/dl)	0.74	0.77	0.69	0.71	0.02
Urea (mg/dl)	22.24	21.48	23.06	22.04	0.28
Cholesterol (mg/dl)	118.16 ^a	117.24 ^a	114.11 ^b	109.02 ^c	1.23
Glucose (mg/dl)	93.41	92.82	92.64	93.08	0.24

Means (abc) in the same row with different superscripts are significantly ($P < 0.05$) different.

PKM=Palm kernel cake, BDG=Brewer’s dried grains, WO=Wheat offal. Standard error mean.

Table 3 indicates the effect of substituting maize with PKM, BDG, and WO on the serum biochemicals of growing piglets. Total protein, creatinine, urea, and glucose were not significantly ($P > 0.05$) affected by the dietary treatments. These parameters are indicators of protein reserves and can be specifically influenced by dietary protein shortages (Adesehinwa and Ogunmodede, 2002). The result from this study revealed that protein levels in the experimental diets supported normal protein reserves in the animals resulting in efficient protein utilization.

High serum creatinine and urea levels in animals are indicators of muscular wastage (Fashina, 1991). The values obtained in this study were fairly constant and comparable across the groups, such that the grower pigs could not have suffered muscular wastage but efficient utilization of diets. Maize and palm kernel meal diets had more significant ($P < 0.05$) values in the cholesterol levels. This could probably be due to higher levels of fat in the maize and PKM diets as expected. This research finding corroborates the results of Adesehinwa and Ogunmodede (2002) and Igene (2006) who also reported comparable levels of glucose.

CONCLUSION

Since the values obtained in the experimental diets compared favorably with the control diet (normal ranges) as revealed in some literature, it could be concluded that the test experimental ingredients could partially or wholly alternate maize as an energy source as there were no adverse health implications in the animals arising from the experimental diets.

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