Journal of Agripreneurship and Sustainable Development (JASD)
www.jasd.daee.atbu.edu.ng; Volume 3, Number 4, 2020
ISSN (Print): 2651-6144; ISSN (Online): 2651-6365

EFFECT OF REPLACING MAIZE WITH CASSAVA LEAF SIEVATE MEAL ON GROWTH, HAEMATOLOGICAL AND SERUM INDICES OF BROILER CHICKS

[1]Kehinde, A. S., [2]Adelakun, K. M., [1]Abdul-Azeez, F. I. and [1]Fadimu, B. O.
[1]Department of Wildlife and Ecotourism, Forestry Research Institute of Nigeria, PMB 5054, Jericho Hill, Ibadan Oyo State, Nigeria
[2]Department of Wildlife and Ecotourism, Federal College of Wildlife Management, Forestry Research Institute of Nigeria, PMB 268, New Bussa, Nigeria
Corresponding Authors' E-mail: adelakunkehinde@gmail.com **Tel.:** +2348034784947

ABSTRACT
The study was carried out to examine effect of replacing maize with cassava leaf sievate meal on growth, haematological and serum indices of broiler chicks. In the study, 288 day old broiler chicks were randomly allotted to experimental diets (starter and finisher) cassava sievate-leaf meal (CSLM) based diets with the CSLM as replacement for maize. The trial lasted eight (8) weeks; and also four (4) diets each were compounded for starter and finisher phases in which CSLM replaced maize (0, 15, 30 and 45%). The diets were isocaloric and isonitrogenous based on the age birds. The chicks were raised on deep litter system with stand health and management practices to evaluate growth performance, haemotogical and serum indices. Test feed stuffs, diets and blood samples and all data collected were also analyzed using analysis of variance (ANOVA). The proximate composition of feed stuffs revealed that cassava sievate meal (CSM) had 2.34% crude protein (CP), while the values for cassava leaf meal CLM and CSLM were 19.45% and 8.50, respectively; and the highest nitrogen free extract (NFE) (87.09%) was recorded for CSM. The starter and finisher diets had recommended levels of energy (2800 Kcal/kg -3000 Kcal/kg) and crude protein (19-22%). Daily feed intake compared ($P \leq 0.05$) in $T_1 – T_4$, the best daily weight gain (38.569) was recorded for T_1 and compared with T_2. Utilization of feeds reduced with increased level of CSLM; and highest pack cell value (PCV) 24.34% was recorded for T_4 while other haemotological factors were significantly ($P \leq 0.05$) varied. Serum creatinine and Cholestrol were elevated at T_4. The study concluded that CSLM can be utilized by broiler chicks up to 45% as replacement for maize without any adverse effect. It was therefore, recommended that poultry farmers should adopt 30% CLSM inclusion in the diet of growing broiler for efficient growth and good body health.

Keywords: Blood parameters, Cassava leaf-sievate, Diets, Energy sources, Growth performance.

INTRODUCTION
Protein supply is inadequate in developing countries and this has led to nutritional related diseases such as kwashiorkor and Marasmus (Aguihe, 2014). There is need to beef up protein production at cheaper cost (Oluyemi and Roberts, 2000) since cost of feed accounts for about 70%-80% of the total cost of animal production. There is therefore, urgent need to reduce the cost of feed by sourcing for agro-by-products which are cheap, available and most often eaten by livestock.

Alternative feedstuffs, such as *Afzelia africana* seed, neem leaf and *Gmelina* leaf have been used in animal production as feeds. They however, need little processing, such as soaking, toasting, cooking and sun drying to reduce their level of anti-nutritional factors. According to Tewe and Egbunike (1992), energy source constitute 45%-60% of finished feeds in monogastrics and cassava by products can be used as the major source of energy for broilers and pigs (Tewe, 2004).

Nigeria presently, is the world's largest producer of cassava. Cassava sievate-leaf meal is readily available all year round (Kehinde, 2009). The leaf is rich in crude protein (25%-32%) and the tuber is a good source of energy and soluble carbohydrate (Agunbiade *et al.*, 2002). The choice of a blend of cassava sievate and leaf as energy source in broiler chicks' ration is because they are by-products that can be sourced after harvesting and processing.

It is expected that the nutritive value of cassava sievate meal (CSM) with a low crude protein content of 2.34% (Kehinde *et al.*, 2020) will be improved when moved with cassava leaf. This will be of good value to feed millers and poultry farmers as it will offer a new and reliable source of energy in poultry production (Olorede *et al.*, 2002). However, the major constraint of cassava utilization by monogastric is the presence of anti-nutrient, such as the cynogenic glycoside presence and the high crude fiber.

The choice of broiler chicks for the study was due to its short maturity period of between 8 weeks to 12 weeks. This can be annexed to meet the protein needs of the ever increasing population of Nigeria. Feeding is an aspect of animal production that can be adopted to sustain its genetic potential; it is also important to evaluate its effect on the blood parameters, to determine the general well-being of livestock including poultry.

MATERIALS AND METHODS

Experimental Site

The trial was conducted at poultry section of the Federal College of Wildlife Management, New Bussa, Niger State. The College which lies within northern guinea savanna is located between Kainji Dam and New Bussa town, about 2km along awuru road and lies between longitude $9^{o}\,82^{'}\,30''$ and $9^{o}\,49^{'}\,22''$N and latitude $4^{o}\,58^{'}\,16''$ and $4^{o}\,34^{'}\,53''$ E. It has a total area of 2.56km^2 (Onyeanusi, 2005).

Experimental Animal

A total of 288 day old broilers chicks used for this trials were sourced from Zartech Farm, Ibadan; a more reliable hatchery, based on the most recent market information. The birds were randomly allocated to four (4) experimental treatment at 72 birds per treatment and 24 per replicate while each treatment was replicated three (3) times.

Cassava Sievate Meal used for the Trial

Cassava sievate-leaf meal used for the trial was obtained by mixing cassava sievate and cassava leaf in ratio 50:50 by weight.

Management of Experimental Chicks

The pens used for the trial were cleaned and disinfected two (2) weeks before the arrival of the chicks; the pen were partitioned to take care of all treatments and replicates. The birds were vaccinated and given routine medication; and food and water were offered *ad libitum*.

Data Collection

Data on the feed intake and weight gain to determine the feed conservation ratio were collected daily, weekly and at the end of the eighth (8) weeks for starter and finisher phases.

Chemical Analysis

The proximate composition of cassava sievate, cassava leaf, cassava sievate-leaf meal and experimental diets were carried out using the method of A. O. A. C, 1990.

Analysis of Blood Parameters

Four (4) birds were randomly selected from each replicate sacrificed and blood sample collected through the puncture of their jugular vein; and 2ml of blood was collected into sample bottle which contains Ethylene Diamine Tera Acetic acid (EDTA); an anti-coagulant for haematological indices determination; and another to 2ml of blood was collected into a bottle which did not contain EDTA for serum chemistry determination. The following parameters were determined Pack Cell Volume (PCV), Red blood cell (RBC), Haemoglobin (HB), White Blood Cell (WBC) concentration, and its differential; Neutrophils, monocytes Means Corpusclar Volume (MCV), Mean Capuscular Haemoglobin Count (MCHC), Total protein, creatinine, urea, Uric acid Glucose, Alumin, Bilirubin, cholesterol, Triglycerides and minerals salt as described by Dacie and Lewis (1995).

Statistical Analysis

Data obtained were subjected to analysis of variance (ANOVA) by the method of Steel and Torrie (1980) where the significant mean difference were separated by the method of Duncan multiple range test (Duncan, 1995).

RESULTS AND DISCUSSION

Table 1 and Table 2 shows the gross composition of diet feed to broiler starter and finisher chicks, respectively. The starter had 22.47% - 22.55% crude protein and about 2,800 Kcl/kg metabolisable energy (ME); while the finisher diet had between 20.65% - 20.74% crude protein and (2,775 Kcal/kg ME - 2,842 Kcal/kg ME).

Table 1: Gross Composition of Cassava Sievate-leaf Meal Diets Fed to Broilers Starter

Ingredients (kg)	Treatment			
	T_1 (0%CSLM)	**T_2 (15% CSLM)**	**T_3 (30% CSLM)**	**T_4 (45% CSLM)**
Maize	47	39.95	32.90	25.85
Maize bran	8.00	8.00	8.00	8.00
CSLM		-	7.05	14.10
Soya	14	14	14	14
GNC	13	13	13	13
PKC	7	7	7	7
Rice bran	1	1	1	1
Fish Meal	6	6	6	6
Bone Meal	2	2	2	2
Limestone	1	1	1	1
Methionine	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Total (Kg)	**100**	**100**	**100**	**100**
Crude Protein (%)	**22.54**	**22.55**	**22.47**	**22.49**
Metabolisable Energy (Kcal/kg)	**2,887**	**2,878**	**2,868**	**2,828**

Source: Field data, 2018

However, in Table 1, the gross composition of the experimental diets revealed that all nutritional components of the diets most importantly crude protein (CP) for both growing phase was adequate as the requirement were 22-24% for broiler starter while 19-21% CP with either 2800 Kcal/kg or 3000 Kcal/kg of metabolisable energy was recommended for broiler finisher (Oluyemi and Robert, 2000; Fetuga, 1984; and Onwudike, 1983).

Table 2: Gross Composition of Cassava Sievate-leaf Meal Diets Fed to Broiler Finishers

Ingredients (kg)	**Treatment**			
	T_1 (0% CSLM)	**T_2 (15% CSLM)**	**T_3 (30% CSLM)**	**T_4 (45% CSLM)**
Maize	45	38.07	31.14	24.21
Maize bran	14	14	14	14
CSLM	-	6.93	13.86	20.79
Soya	15	15	15	15
GNC	11	11	11	11
PKC	5	5	5	5
Rice bran	1	1	1	1
Fish Meal	4	4	4	4
Bone Meal	2	2	2	2
Limestone	1	1	1	1
Methionine	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Total (Kg)	**100**	**100**	**100**	**100**
Crude Protein (%)	**20.74**	**20.70**	**20.66**	**20.65**
Metabolisable Energy (Kcal/kg)	**2,842**	**2,833**	**2,832**	**2,725**

Source: Field data, 2018

Table 3 had the proximate composition of cassava sievate, cassava leaf and cassava sievate-leaf meal. This shows that cassava sievate-leaf meal had crude fiber content of 16.00%; also the highest soluble carbohydrate of 87.09% was found in sievate. The result further revealed that the cassava sievate-leaf meal mixture had crude protein of 8.50%, compared to that of maize, which is 9% - 10% (Aduku, 2005) depending on the process and environment; thus, CLSM is a good source of dietary protein and energy for broiler.

Table 3: Proximate Composition of Cassava Sievate, Leaf and Cassava Sievate-leaf Meal Blend

Proximate parameters	**% Proximate composition**		
	CSM	CLM	CSLM
Dry Matter	84.94	57.36	91.01
Crude Protein	2.34	19.45	8.50
Crude Fibre	7.35	12.15	16.00
Ether Extract	0.25	2.10	6.00
Ash	5.12	8.94	13.00
Nitrogen Free Extract	87.09	57.39	47.60

Note: CSM = Cassava sievate meal, CLM = Cassava leaf meal, CSLM = Cassava sievate-leaf meal
Source: Field data, 2018

The high ash content of CLSM (13.00%) in Table 3 implies that it is rich in mineral salt (Oboh and Aluyor, 2009). Generally, CLSM contains appreciable amount of basic food nutrients, such as protein, fat, carbohydrate and crude fibre (Kehinde *et al.*, 2020).

Table 4 and Table 5 had the proximate composition of diets fed to starter and finisher chicks, respectively. This showed the values for the different proximate constituents that the starter diets had crude protein of over 20.00%, while finisher diets had crude protein content of about 19.00%. The diets adopted for the feeding trial at the 2 phases of growth were rich in nutrients and contained recommended energy crude protein, calcium and phosphorus needed for the different growing stages of the birds. The starter diets and finisher diets each had comparable crude protein and metabolizable energy which agreed with the NRC recommendation reported by Oluyemi and Roberts (2000).

Table 4: Proximate Composition CLSM based Diets Fed to Broiler Starter Chicks

Proximate parameters	**% Proximate composition**			
	T_1(0% CSLM)	**T_2(15% CSLM)**	**T_3(30% CSLM)**	**T_4(45% CSLM)**
Dry Matter	93.80	90.72	91.34	90.67
Crude Protein	20.80	23.27	22.97	21.7
Crude Fibre	2.50	3.28	3.89	5.27
Ether Extract	4.60	3.51	3.62	4.14
Ash	4.00	9.13	6.41	7.16
Nitrogen Free Extract	36.44	38.00	36.43	37.01

Source: Field data, 2018

Table 5: Proximate Composition of Cassava Sievate-leaf Meal based Diets Fed to Broiler Finisher

Proximate parameters	**% Proximate composition**			
	T_1(0% CSLM)	**T_2(15% CSLM)**	**T_3(30% CSLM)**	**T_4(45% CSLM)**
Dry Matter	90.20	89.30	90.20	91.22
Crude Protein	19.90	19.45	19.04	18.78
Crude Fibre	6.86	8.30	8.03	7.78
Ether Extract	11.69	13.00	12.25	7.60
Ash	7.75	5.90	5.90	12.00
Nitrogen Free Extract	44.00	42.65	44.98	45.06

Source: Field data, 2018

Growth performance of the broiler chicks was elicited on Table 6 which consisted of average daily weight gain (33.50 g – 38.56 g), daily feed intake (111.60 g - 112.85 g) and feed conservation ratio (5.71% - 6.53%); all growth parameter were significantly varied, except the daily feed intake. All hematological factors of chicks fed with CSLM based diets were significant ($P \leq 0.05$).

Table 6: Growth Performance Indices of Broiler Chicks Fed Cassava Sievate-leaf Meal based Diets

Parameters	T_1(0% CSLM)	T_2(15% CSLM)	T_3(30% CSLM)	T_4(45% CSLM)	SEM ±
IBW g/bird	105.00^a	100.00^a	110.00^a	107.00^a	±8.0
FBWG g/bird	$2,264.49^a$	$2,216.19^a$	$2,129.14^b$	$1,983.02^d$	±10.2
ABWG g/bird	$2,159.49^a$	$2,116.19^b$	$2,019.14^c$	$1,876.02^d$	±10.2
BWG (g/bird)	38.56^a	37.78^a	36.05^b	33.50^c	±1.1
TFI g/bird	630^b	630^c	632^a	625^d	±12.5
DFI g/bird	11.85	11.50	11.94	11.60	±2.01
CR g/bird	5.71^d	5.82^c	6.10^b	6.53^a	±0.2

Note: ^{abc} = means within a row with different superscripts that are significantly different ($P \leq 0.05$);

IBW = Initial body weight (g/bird); FBW = Final body weight (g/bird); ABW = Average body weight gain (g/bird); TFI = Total feed intake (g/bird); FCR = Feed conversion ratio (g/bird);

DBWG = Daily body weight gain (g/bird); DFI = Daily feed intake (g/bird).

Source: Field data, 2018

Also, in Table 6 results, birds on T_1 which is the control treatment without CSLM inclusion had the best and highest final body weight gain. There was a downward trend in weight gain as the level of CSLM increased in the diet; this could be attributed to the anti-nutritional factors in the test ingredients (Akinfala *et al*., 1999). The total feed intake decreased with increased levels of CSLM. This may be due to the bitterness of cassava by-products, its dustiness and reduced density of the feed (Aguihe, 2014). CSLM inclusion in the diets led to dilution of nutrients. Fasuyi (2005) reported the CSLM contained anti-nutritional factors, such as phytase, tannin and Cyanogenic glycosides, which may reduce the palatability of the diet.

The results for the haematology as presented in Table 7 shows elevated PVC, RBC, HB, Eosinophils, Basophils and MCV, as inclusion of CSLM increased. The levels of PCV, HB and RBC in the study which exhibit same pattern of variation is in accordance with Olumide *et al.* (2018) and Adejumo (2004) who reported that PCV, RBC and haemoglobin were positively correlated with the nutritional status of animal. The best PCV was obtained in T_4, while the least was in T_2, the increased level of PCV could be a defense mechanism to protect the body. The mean corpuscular values obtained was 1.28-1.57 (Nm^3) were significantly varied ($P \leq 0.05$) between the treatments; abnormally low level could lead to necrotic erythrocytes usually associated with folic acid or Vitamin B_{12} deficiency (Orawan and Aengwarich, 2007). The reported mean corpuscular hemoglobin concentration of 31.70 to 33.90 were within the range obtained by Olorede *et al.* (2011), but higher than 30.45% to 29.0% reported by Madubuike and Ekenyem (2006). The levels of Eosinophil, Basophil, and Neutrophil were normal and aligned with the findings of Obikaonu *et al*. (2012). This suggests that adoption of CSLM did not cause any adverse effect on the health of the birds, since their values were within the recommended levels.

Table 7: Heamatological Indices of Broiler Chicks Fed Diets Containing Cassava Sievate-leaf Meal

Heamatology indices	T_1(0% CSLM)	T_2(15% CSLM)	T_3(30% CSLM)	T_4(45% CSLM)	SEM ±
PCV (%)	17.00^c	16.00^d	19.00^b	24.34^a	1.01
RBC ($x10^6$/ul)	1.38^C	1.23^d	1.54^b	1.74^a	0.56
Hb (g/100ml)	5.59^c	5.23^d	6.10^b	8.20^a	0.36
WBC ($x10^3$/ul)	1.79^b	1.57^c	1.78^b	2.18^a	6.60
Easinophils (%)	6.29^b	6.26^b	6.23^b	6.49^a	0.06
Basophils (%)	4.35^b	4.24^c	4.09^d	4.42^a	0.09
Neutrophils (%)	29.69^b	29.58^c	29.40^d	30.44^a	0.16
Lymphocytes (%)	97.47^b	97.70^a	96.00^d	97.30^c	0.68
MCH (u)	41.44^c	42.10^b	41.50^c	48.77^a	1.29
MCHC (%)	32.17^b	33.90^a	31.70^c	31.44^d	0.30
MCV (um^3)	1.35^b	1.28^c	`1.23^c	1.57^a	3.95

Note: a,b,c,d is mean in the same row with different superscripts that are significantly different ($P \leq 0.05$); PCV = Packed sell volume; RBC = Red blood cell; WBC = White blood cell; HB = Haemoglobin; MCV = Mean corpuscular value; MCH = Mean corpuscular haemoglobin; MCHC = Mean corpuscular haemoglobin concentration.
Source: Field data, 2018

Table 8 elicited serum metabolites: with highest serum glucose (1.69 mg/dl) in T_3 and least in T_4 while highest total serum protein and sodium ion were in T_2. The level of serum protein obtained was highest in T_2, while all values were significantly ($P \leq 0.05$) varied in the treatments, all values were higher than what was reported by Olorede *et al*. (2002) and lower than what was reported by Fasuyi (2005) who said the level of serum protein could be high or low. High serum protein could be due to drug therapy, infectious peritonitis and chronic inflammation, while low serum protein could be due to liver problem. In this study the level was normal and no side effect was recorded.

Creatinine is constantly formed in the muscle; its measurement is to determine the functioning of the kidney (Lane and Gutrie, 2001). When the level is abnormally high, it is on indication of the malfunctioning of the nephrons. A recent study suggested that a lower serum create nine level is associated with an increased risk of developing type 2 diabetes (Harita *et al.*, 2008).

The cholesterol level in the serum compared in T_1, T_2 and T_3 and lower ($P \leq 0.05$) than value for T_4, increased cholesterol should be discouraged, this level was not harmful to the broiler, because there was no fat accumulation when carcass was eviscerated. The value recorded 128.02 mg to 130.39 mg did not constitute any health risk.

The levels of aspartate transaminase was safe (22.40 iu/l - 23.40 iu/l) and lower than 32.00 iu/l and 53.33 iu/l reported by Obikaonu *et al.* (2012). The AST values reduced as CSLM levels increased in the test diets, indicating no toxic effect within the liver parenchyma of the birds.

Na^+ and Na^{3+} are critical in the serum; care must be taken to avoid Na^+ elevation since there was increased Na^+ with an increased level of CSLM and reduction in K^{3+}. These trends were not so critical to cause side effect. There should be caution in the feed formulation to reduce sodium and improve potassium utilization.

Table 8: Serum Metabolites of Broiler Birds Fed Cassava Sievate-leaf Meal Based Diets

Serum biochemical indices	T_1(0% CSLM)	T_2(15% CSLM)	T_3(30% CSLM)	T_4(45% CSLM)	SEM ±
Total Protein	4.90^b	4.97^a	4.87^c	4.90b	0.03
Creatinine (g/dl)	61.40^c	58.98^d	63.11^b	64.06^a	0.61
Glucose (mg/dl)	1.10^c	1.34^b	1.67^a	1.06^c	0.07
Albumin (mg/dl)	3.57^a	3.52^a	3.42^b	3.16^c	0.03
Cholesterol (mg/dl)	128.04^b	128.02^b	128.34^a	130.37^a	0.42
AST (iu/l)	23.40^a	22.60^b	22.24^c	22.02^d	0.21
ALT (iu/l)	9.49^c	10.60^b	11.22^a	10.52^b	0.20
Na^{2+} (Mmol/L)	91.34^d	97.24^a	92.47^c	93.77^b	0.70
K^{3+} (Mmol/L)	4.57^a	4.00^a	3.94^d	4.20^b	0.08

Note: a,b,c,d is mean in the same row with different superscripts that are significantly different P≤0.05); AST = Aspartate transamine; ALT = Alanine transamine; Na^+ = Sodium; K^{3+} = Potassium.
Source: Field data, 2018

CONCLUSION AND RECOMMENDATIONS

In conclusion, CSLM can effectively replace maize in broiler diet at 30% inclusion level without any side effect on the health of the birds; it also improves feed intake, weight gain and feed conversion ratio. The use of CSLM up to 45% as maize replacement performed better when broiler health is considered. Blood indices such as PCV, HB, WBC, and MCHC values increased with increased level of CLSM. Based on the present study, poultry farmers should adopt 30% CLSM inclusion in the diet of growing broiler for efficient growth and good body health.

REFERENCES

A.O.A.C (1990). *Official method of Analysis*. 15th Edition. Association of Official Analytical Washington D.C, U.S.A.

Adejumo D. O. (2004). Performance, organ development and haematological of rats fed sole diets of graded levels of cassava flour and soybean flour (Soygari) as substitutes for energy and protein concentrates. *Trop. J. Anim. Sci.,* **7**: 57-63.

Aduku, A. O. (2005). *Tropical feed stuff analysis table*. Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria, Nigeria.

Aguihe, P. C., Kehinde, A. S., Fatokun, B. O., Omotugba, S. K. and Ashifat, A. A. (2014). Effect of enzyme supplementation on haemotolgy and serum biochemistry of broiler finishers fed cassava peel meal based diets. *Tropical Animal Production Investigation,* **17**(1): 47-51.

Agunbiade, J. A., Adeyemi, O. A. and Adepoju, O. A. (2002). The use of whole cassava meal and leaf in broiler diets. *Tropical Journal of Animal Science,* **5**(1): 161-173.

Akinfala, A., Kehinde, A. S., Abu, A. O. and Tewe, O. O. (1999). Performance and economy of production of growing pigs fed whole cassava plant diets. *Tropical of Animal production Investigation,* **2**: 181-186.

Dacie, J. V. and Lewis, S. M. (1995). *Practical haematology*. 8th Edition, Churchil Livingstone, Edinburgh.

Duncan, D. B. (1955). Multiple range and Multiple F. Test. *Biometrics,* **11**: 1-42.

Fasuyi, A. O. (2005). Nutrient Composition and Processing Effects on Cassava Leaf (*Manihot esculenta* Crantz) Antinutrients. *Pakistan Journal of Nutrition*, 4: 37-42. http://dx.doi.org/10.3923/pjn.2005.37.42.

Fetuga, B. L. (1984). *Techniques in feed formulation.* Paper presented at the Feedmill Management Training Workshop. Dept. of Agricultural Economics, University of Ibadan. April.

Harita, N., Hayashi, T., Sato, K., Nakaruma, K., Yoneda, T., Endo, G. and Kainbe, H. (2008). Lower serum creatinine is a new risk factor for type 2 diabetes: The Kansai Health care Study, *Diabetes care,* **32**: 424 Doi: 10.2337/dc08.

Kehinde, A. S. (2009). *Utilization of cassava by-products by growing Snails.* PhD thesis submitted to the University of Ibadan. Pp.146.

Kehinde, A. S., Babatunde, T. and Kehnde, O. J. (2020). Growth performance, qualitative and economic evaluation of snails (*Archachatina marginata*) fed cassava byproducts. *The Pacific Journal of Science and Technology*, **21**(1): 253-259.

Lane, A. and Guthrie, S. (2001). *Dictionary of veterinary nursing.* Read Educational and Professionl Publishing Ltd. Linacre, House Jordan Hall, Oxford.

Madubuike, F. N. and Ekenyem, B. U. (2006). Haemology and serum biochemistry characteristics of broiler chicks fed varying dietary levels of *Ipomoea sarifolia* Leaf meal. *International Journal of Poultry Science,* **5**(1): 9-12.

Obikaonu, H.O., Opara, M. N., Okoli, I. C., Okoro, V. N., Ogbuewu, I. P., Etuk, E. B. and Udebibe, A. B. (2012). Haemotological and serum biochemical indices of starter broilers fed leaf meal of Neem A*zadirachta indica*) *Journal of Agric Tech.,* **8**(1): 71-79.

Oboh, I. O. and Aluyor, E. O. (2009). *luffa cylindrical*, an emerging cash crop. *African J. Agric. Res.,* **4** (8): 684-688.

Olorede, B. R., Abdurahim, I., Ajagbunna, O. P. and Akinleye, O. A. (2002). *Blood chemistry and Histopathogy of cockerels fed cassava flour.* Proceedings of the 7th Annual conference Animal Science Association of Nigeria (ASAN), University of Agric Abeokuta, Nigeria. Pp. 247-248.

Olumide, M. D., Chioma, G. O., Ajayi, O. A. and Akinboye, O. E. (2018). Performance, haematological and serum biochemical profile of broilers chicken fed diets supplemented with *Ocimum gratissimum* meal. *International Journal of Modern Biological Research,* **6**: 27-34.

Oluyemi, J. A. and Roberts, F. A. (2000). *Poultry Production in Warm Wet Climates.* Macmillan Publishers Limited, London; Pp.3-156.

Onwudike, O. C. (1983). Energy and protein requirements of broiler chicks in humid tropics. *Tropical Animal Production,* **8**: 39-44.

Orawan, C. and Aengwanich, W. (2007). Blood Cell Characteristics, Hematological Values and Average Daily Gained Weight of Thai Indigenous, Thai Indigenous Crossbred and Broiler Chickens. *Pakistan Journal of Biological Sciences,* **10**: 302-309.

Steel, J. D. and Torrie, J. H. (1980). *Principle and proceeding of statistics*. Mc Grawhil books company. New York Toronto; 40Pp.

Onyeanusi, A. E. (2005). *Study of Flora and Fauna at F.C.W.M. site, New Bussa.* Research report. Forestry Research Institute of Nigeria (FRIN), Ibadan, Nigeria. 64Pp.

Tewe, O. O. (2004). *The global cassava development strategy: Cassava for livestock feed in sub-Saharan Africa.* Rome, Italy: International Fund for Agricultural Development (IFAD) and Food and Agriculture Organisation (FAO).

Tewe, O. O. and Egbunike, N. G. (1992). *Utilization of cassava in non-ruminants livestock feed.* Proceeding of IITA/ILCA/University of Ibadan Workshop on the potential utilization of cassava as livestock feed in Africa; Pp.28-38.