Growth performance, cost benefits, haematological and serum indices of gilts fed fortified ensiled cassava root-leaf blends as a replacement for maize

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Abstract

An 8-week feeding trial to investigate the inclusion of ensiled cassava root-leaf blends (ECRLB) fortified with no additive (ECRLB1), Allzyme® SSF (ECRLB2), amino acids (ECRLB3) and Allzyme + amino acids (ECRLB4) at 30% replacement value for maize in diets of gilts was conducted. Maize based diet (MBD) served as control. Twenty gilts (3−4 months old) were randomly allotted to dietary treatments in a completely randomized design with 4 pigs per treatment. Growth performance, haematological indices and serum chemistry were measured. Improved ($P<0.05$) weight gain was recorded for gilts fed ECRLB3 (433g d^{-1}) and ECRLB4 (419g d^{-1}) than others. Feed to gain ratio of fortified ECRLB group were similar to MBD but better ($P<0.05$) than ECRLB1. The feed costs (₦155.34− ₦162.17) kg^{-1} weight gain of gilts fed fortified ECRLB were lower ($P<0.05$) than MBD (₦176.74). Haematological indices and serum chemistry values for gilts fed MBD and fortified ECRLB fell within the recommended range. It was concluded that fortified ECRLB could be used to replace maize in the diets of gilts for optimal performance.

Keywords: Gilts, performance, cost benefit, haematological and serum indices, ensiled cassava root-leaf blend, maize based diet.

Introduction

Feed cost accounts for about 55-80% of the total cost of pig production in Nigeria and other developing countries (Osondu *et al.*, 2014). Maize constitutes the largest proportion of the feed ingredients that supply the energy component of feed for monogastric animals in Nigeria. It is also used as the major source of human food and for other industrial cereal products (FAO, 2002). This brings about the demand for maize higher than its supply and exhibits frequent price fluctuations thus making it uneconomical to use in compounding diet especially during off season period. It therefore becomes imperative to provide a relatively cheaper and readily available alternative energy feedstuff that can replace maize in order for livestock particularly swine production to thrive well in Nigeria.

A good example of such alternative feedstuff is cassava. It is a tuber rich in energy and has been used in several research works to replace maize either partially or completely in swine diets (Akinfala and Tewe 2004; Sauvant *et al.*, 2004; Nnadi *et al.*, 2010) etc. However, its use is limited by its low protein content (1-3%) and presence of anti-nutritional factors particularly cyanogenic glycosides (Araujo *et al.*, 2016). Ingestion of fresh or unprocessed cassava based diets containing sub-lethal dietary cyanide has reportedly caused impaired thyroid function and growth, neonatal deaths and lower birth rates in animals (Ernesto *et al.,* 2002; Fatufe *et al.*, 2007). Removal of these limitations therefore becomes pertinent if the rich energy potential of cassava is to be harnessed. Various methods of processing have been described: grating and crushing (Cardoso *et al.,* 2005), soaking (Nyirenda *et al.,* 2011), boiling or cooking (Hidayat *et al.*, 2002), sun-drying and ensiling (Phuc *et al.,* 2001).

In the tropics, the most common methods for reducing cyanide contents are sun-drying and ensiling (Phuc *et al.,* 2001). However, in the rainy season, sun drying becomes difficult and may result in the production of low quality product with severe *Aspergillus* and Aflatoxin contamination (Adjovi *et al.,* 2015) thus, making ensiling a more appropriate method since it is not season bound. Furthermore, ensiling has been found to improve the palatability and nutritional profile of cassava products and also increased the feed efficiency and improved performance of pigs (Borin *et al.,* 2005; Kil and Stein 2010).

Another remedy to the limitations of cassava roots is the use of cassava leaves; a byproduct of cassava root harvest which is rich in crude protein (14-40%DM; Adewusi and Bradbury 1993) as a supplement to cassava roots in swine diet. Previous researches have shown that cassava root and leaf mixture can be used effectively to replace maize in swine diet. However, for optimal utilization, essential amino acids (methionine and lysine) imbalance of the lea must be put into consideration (Nguyen *et al.,* 2011). Some form of physical treatment (enzyme supplementation) may also be necessary due to the fibrousness of the feedstuff for the breaking down of the fibre encapsulating the more soluble constituents so that digestive secretions can penetrate more completely (Kidder and Manner 1978; Adesehinwa *et al.,* 2008). This study therefore sought to improve the utilization of ensiled cassava root-leaf blend by fortifying it with amino acids (methionine and lysine), enzyme (Allzyme® SSF) and a combination of amino acids and enzyme by gilts.

Materials and Methods

Preparation of silage of cassava roots and leaves

Based on the outcome of our previous experiment, a cassava root leaf blend was prepared in ratio of 70:30 roots and leaves, respectively. Fresh cassava roots were harvested from demonstration plots at the Federal University of Agriculture (FUNAAB), Abeokuta. The roots were washed in water to remove the adhering dirts and sand and then ground in a locally fabricated grating machine (diesel engine of 8hp, Lagos, Nigeria). The ground (sieve size 2mm) cassava pulp were then packed in Hessian bags and placed under a locally fabricated hydraulic presser (cassava dewatering machine) for 24 hours for the purpose of removing the effluent. The cassava leaf biomass (a mixture of leaves, petioles and stalks) remaining after harvesting of cassava roots were collected and wilted overnight to reduce 20% of the moisture content in order to facilitate fermentation and later chopped (into 4-cm long cuts). The dewatered cassava pulp was then mixed together with the wilted leaf biomass at the ratio of 70:30 of root and leaf, respectively. The mixture was then poured rapidly into nylon bags and pressed intermittently to express air out of the bags so as to minimize the loss of nutrients by oxidation. The nylon bags with a capacity of 25 kg were filled to three-quarter, tied and kept in sealed air tight plastic silos for 21 days before use. The product obtained; Ensiled Cassava Root-Leaf Blend (ECRLB), was then used in feeding the experimental animals.

Chemical composition of the ensiled product

Quadruplicate ground samples of the dried ECRLB were used for the determination of proximate constituents in accordance with the official analytical methods of the AOAC (1995). The cyanide contents of the samples were determined using the protocols described by Anhwange *et al.* (2011). Phytate and oxalate contents were determined using the methods described by Haritha and Jayadey (2017), while the tannin contents were determined by the methods of Makkar *et al.* (1993). The mineral composition of the samples was determined according to the protocols of Sodamade *et al.* (2013). The gross energy value of the samples was determined according to standard procedures using the Adiatic Bomb Calorimeter (Model 1261; Parr Instrument Company, Moline, IL, USA). The chemical composition of the blend is presented in Table 1.

Location of the experiment (Feeding trial)

The experiment was carried out at the Piggery Unit of the Directorate of University Farms (DUFARMS) Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. The farm lies within latitude 7°10´N, longitude 3°2´E and altitude 76 mm. It is located in the derived savannah zone of South-Western Nigeria. It has a humid climate with mean annual rainfall of about 1037 mm and temperature of about 34.7°C. The relative humidity ranges from 63 to 96% in the rainy season (late March to October) and from 55 to 82% in the dry season (November to early March) with an annual average humidity of 82%. The seasonal distribution of annual rainfall is approximately 44.96 mm in the late dry season (January-March); 212.4 mm in the early wet season (April-June); 259.3 mm in the late wet season (July-September) and 48.1 mm in the early dry season (October-December) as documented by Federal University of Agriculture, Abeokuta Meteorological Station.

Experimental diets

ECRLB were supplemented with additives to compensate for the nutritional imbalances of cassava root and leaf as follows: ECRLB1 (ECRLB + no additive), ECRLB2 (ECRLB +methionine and lysine at 25g/ton), ECRLB3 (ECRLB + Allzyme(® SSF at 300g/ton), ECRLB4 (ECRLB + methionine and lysine +Allzyme(® SSF at 25g and 300g/ton, respectively). These feed mixes (ECRLB 1-4) were incorporated to replace maize at 30% in the experimental diets of the gilts to make four test diets while a maize based diet (MBD) served as the control diet to have five experimental diets. The experimental diets were formulated to meet the requirement standard of NRC 2012. (Table 2).

Experimental animals, design and management

Twenty cross-bred (Large White x Landrace) gilts within the ages of 3-4 months and an initial average weight of 30 kg were used for the experiment. The pigs were randomly allocated to the 5 dietary treatments in a completely randomized design with 4 pigs per treatment. The pigs were housed and fed individually in concrete pens equipped with shallow concrete feeders and drinkers. Fresh and clean water was made available *ad-libitum* to the animals throughout the experimental period of 8 weeks

Data collection

Haematological indices and serum biochemistry

At the end of the experimental period (day 56), 10ml of blood was collected before feeding in the morning from each of the pigs in each treatment through the jugular vein puncture using sterilized needle and syringes.

Five (5) ml of blood was dropped into EDTA sample bottles, rolled gently till fresh blood was mixed properly with the anticoagulants for haematological analyses. The haematological analyses were performed using an auto haematology analyzer (Mind ray, BC -2800 Vet) to determine the following parameters; Packed Cell Volume (PCV), Red Blood Cells (RBC), Haemoglobin (Hb), White Blood Cells (WBC), Mean Cell Haemoglobin (MCH), Mean Cell Haemoglobin Concentration (MCHC), Mean Cell Volume (MCV), Platelet and Mean Platelet volume (MPV). The remaining 5 ml for serum analyses were allowed to clot before centrifuging to obtain the serum. The separated sera were decanted into sterile bijoh bottles for laboratory analyses. The serum metabolites (total protein, albumin, globulin, creatinine, urea and cholesterol) were estimated using commercial kits of Span diagnostics, Surat, India.

Growth performance and cost benefits

Data were collected on initial weight, final weight, daily feed intake and daily weight gain and feed conversion ratio was computed. Feed cost per kg of feed, feed cost per day and feed cost per kg weight gain were calculated.

Statistical analysis

Data generated were subjected to one-way analysis of variance in a completely randomized design using SAS, 2000. The means for treatment showing significant differences were using Tukey's test of the same statistical software package.

Results

The chemical composition of cassava root-leaf blend (70:30) used in this study are presented in Table 1 while the percentage composition of the experimental diets are presented in Table 2. Growth performance and cost analysis of gilts fed with diets containing fortified ensiled cassava root-leaf blends is shown in Table 3. Gilts fed ensiled cassava root-leaf blend fortified with amino acids and enzyme (ECRLB3) recorded the highest ($P<0.05$) average daily weight gain (ADWG), while those fed ECRLB1 recorded the least ($P<0.05$) ADWG, moreover those fed maize based diet (MBD) and ECRLB2 recorded similar ADWG. Highest ($P<0.05$) and the worst feed to gain ratios were obtained with the gilts fed ECRLB1 while other groups (MBD, ECRLB2, ECRLB3 and ECRLB4) recorded similar values. Feed cost per kg of weight gain of gilts fed ECRLB1 showed higher ($P<0.05$) value, while those on ECRLB3 and ECRLB4 recorded similar values.

Table 1. Chemical composition of ensiled cassava root-leaf blends

Composition	Value
Dry matter (g kg^{-1})	900.00
Crude protein (g kg^{-1})	101.12
Ether extract (g kg^{-1})	110.00
Ash (g kg^{-1})	28.00
Nitrogen free extract (g kg^{-1})	497.80
Crude fibre (g kg^{-1})	190.00
Gross energy (Kcal kg^{-1})	4180.95
Calcium (g kg^{-1})	42.43
Phosphorus (g kg^{-1})	0.43
Magnesium (g kg^{-1})	2.65
Sodium (g kg^{-1})	2.20
Potassium (g kg^{-1})	6.10
Manganesse (mg kg^{1})	0.85
Iron (mg kg^{-1})	22.24
Copper (mg kg^{-1})	3.38
Zinc (mg kg^{-1})	12.01
Hydrocyanide (mg kg^{-1})	0.014
Tannin (g kg^{-1})	0.05
Phytate (g kg^{-1})	0.18
Oxalate (g kg^{-1})	0.07

Table 2. Percentage composition of experimental diets

Ingredients	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5
ECRLB 1	--	30.00	--	--	--
ECRLB 2	--	--	30.00	--	--
ECRLB 3	--	--	--	30.00	--
ECRLB 4	--	--	--	--	30.00
Maize	30.00	--	--	--	--
Brewers dry grain	19.00	19.00	19.00	19.00	19.00
Rice bran	46.90	46.90	46.90	46.90	46.90
Limestone	1.75	1.75	1.75	1.75	1.75
Di-calcium phosphate	1.00	1.00	1.00	1.00	1.00
Lysine	0.90	0.90	0.90	0.90	0.90
Methionine	0.16	0.16	0.16	0.16	0.16
*Premix	0.15	0.15	0.15	0.15	0.15
Salt	0.24	0.24	0.24	0.24	0.24
Total	100.00	100.00	100.00	100.00	100.00
Chemical composition					
ME (Kcal/kg)	2875.50	2958.33	2958.33	2958.33	2958.33
Crude protein (%)	14.07	14.40	14.40	14.40	14.40
Crude fibre (%)	3.20	7.12	7.12	7.12	7.12
Calcium (%)	0.75	0.60	0.75	0.75	0.75
Phosphorus (%)	0.40	0.40	0.50	0.50	0.50
Lysine (%)	0.42	0.42	0.42	0.42	0.42
Methionine (%)	0.28	0.20	0.28	0.28	0.28

*To supply the following per kg diet; VitA 12600 IU; Vit. D3 2800 IU; Vit E 49 IU; Vit K3 2.8 mg; Vit B1 1.4 mg; Vit B2 5.6 mg; Vit. B6 1.4mg; Vit B12 0.014mcg; Niacin 21 mg; Pantothenic Acid 14 mg; Folic Acid 1.4 mg; Biotin 0.028 mcg; Choline Chloride 70 mg; Manganese 70mg; Zinc 140 mg; Iron 140 mg; Copper 140 mg; Iodine 1.4 mg; Selenium 0.28 mg; Cobalt 0.7 mg; Antioxidant 168 mg.

Table 3. Growth performance and cost benefits of gilts fed diets containing ECRLB

Parameters	MBD	ECRLB 1	ECRLB 2	ECRLB 3	ECRLB 4	SEM	P value
Initial weight (kg) gilt^{-1}	30.75	40.00	37.25	32.5	36.25	1.96	0.62
Final weight (kg) gilt^{-1}	52.45	58.75	59.00	56.75	59.75	1.72	0.71
Av. weight gain (kg) gilt^{-1}	0.39^{c}	0.34^{d}	0.39^{c}	0.43^{a}	0.42^{b}	0.61	0.02
Av. daily feed intake (kg)	1.26	1.33	1.32	1.36	1.35	0.57	0.13
Feed to gain ratio	3.25^{b}	3.97^{a}	3.33^{b}	3.12^{b}	3.21^{a}	0.13	0.02
Feed cost kg^{-1}	54.38	49.66	48.70	49.79	49.51	4.20	0.41
Feed cost day^{-1}	68.52	67.04	64.28	66.71	66.84	3.46	0.42
Feed cost kg^{-1} weight gain	176.74^{b}	197.15^{a}	162.17^{c}	155.34^{d}	158.93^{d}	8.10	0.03

$^{a, b, c, d}$ values within the same row with different superscripts differ significantly (*p*<0.05). MBD: maize based diet,
ECRLB1: ensiled cassava root-leaf blend, ECRLB2: ensiled cassava root- leaf blend + amino acids, ECRLB3: ensiled cassava root-leaf blend + enzymes, ECRLB4: ensiled cassava root-leaf blend + amino acids and enzymes.

Haematological indices of gilts fed with diet containing ECRLB's are shown in Table 4. All parameters assayed were significantly (P<0.05) affected by the experimental diet. Gilts fed ECRLB1 recorded lower (P<0.05) concentrations of all parameters assayed except with white blood cells (WBC) where it recorded the highest (P<0.05) values. Increased PCV was obtained with gilts fed MBD and ECRLB2 compared to those fed ECRLB3 and ECRLB4 while those fed ECRLB1 recorded the least (P<0.05) PCV. Improved (P<0.05) Red blood cells (RBC) counts were observed for gilts fed MBD, ECRLB2 and ECRLB4 compared to other groups. Mean cell haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC) values of all the groups were similar (P<0.05). Gilts fed ECRLB2, ECRLB3 and ECRLB4 recorded improved mean cell volume compared to the groups fed the control diet. Serum indices of gilts fed ensiled cassava root leaf blend is presented in Table 5. Total serum protein and Albumin values of gilts fed ECRLB2 and ECRLB4 represented the highest (P<0.05) compared to those fed the control and ECRLB3 diets. Cholesterol concentrations of those fed fortified ECRLB were lower (P<0.05) compared to those fed MBD. Triglyceride concentrations of gilts fed ECRLB3 and ECRLB4 represented the highest (P<0.05) while those fed MBD recorded the least (P<0.05) values. Urea and creatinine concentrations of gilts fed MBD were higher (P<0.05) compared to those fed ECRLB diets.

Table 4. Haematological parameters of gilts fed experimental diets

	Treatments						
Parameters	MBD	ECRLB1	ECRLB2	ECRLB3	ECRLB4	SEM	P value
Packed cell volume (%)	50.50	38.70	49.60	46.00	48.90	1.50	0.03
Red blood cells ($\times 10^{12}$ L^{-1})	7.33	5.18	7.32	6.29	7.22	0.21	0.04
Haemoglobin (g dl^{-1})	14.40^{a}	10.00^{b}	14.30^{a}	13.00^{ab}	13.60^{ab}	0.81	0.02
White blood cells ($\times 10$ L^{-1})	19.60^{b}	21.00^{a}	18.40^{c}	18.80^{c}	18.27^{c}	1.31	0.03
Mean cell haemoglobin (pg)	21.60^{a}	18.80^{b}	21.70^{a}	19.20^{ab}	20.85^{a}	0.25	0.03
MCHC (g dl^{-1})	27.50^{a}	24.80^{b}	27.70^{a}	26.30^{ab}	26.50^{ab}	0.49	0.04
Mean cell volume (fl)	78.30^{a}	69.80^{c}	78.90^{a}	75.80^{b}	76.10^{b}	0.93	0.04
Platelet ($\times 10$ L^{-1})	364.00^{b}	342.00^{d}	367.00^{a}	358.00^{c}	361.00^{b}	4.85	0.02
Mean platelet volume (fl)	9.00^{b}	8.63^{c}	9.82^{a}	9.85^{a}	9.89^{a}	0.12	0.04

[a, b, c, d] values within the same row with different superscripts differ significantly (P<0.05). MBD: maize based diet,
ECRLB1: ensiled cassava root-leaf blend, ECRLB2: ensiled cassava root- leaf blend + amino acids, ECRLB3: ensiled cassava root-leaf blend + enzymes, ECRLB4: ensiled cassava root-leaf blend + amino acids and enzymes, MCHC: mean cell haemoglobin concentration.

Table 5. Serum indices of gilts fed experimental diets

	Treatments						
Parameters	MBD	ECRLB1	ECRLB2	ECRLB3	ECRLB4	SEM	P value
Total protein (g dl^{-1})	8.65^{b}	6.55^{c}	9.17^{a}	8.10^{b}	8.97^{a}	0.21	0.03
Albumin (g dl^{-1})	4.98^{b}	3.30^{c}	5.37^{a}	4.50^{b}	5.52^{a}	0.13	0.03
Globulin (g dl^{-1})	3.67^{b}	3.25^{b}	3.80^{a}	3.60^{ab}	3.45^{b}	0.31	0.02
Cholesterol (mg dl^{-1})	124.57^{a}	110.71^{b}	107.50^{c}	108.63^{c}	109.08^{c}	4.48	0.03
Triglyceride (mg dl^{-1})	98.80^{d}	110.75^{c}	120.10^{b}	125.70^{a}	125.50^{a}	7.09	0.01
Urea (mg dl^{-1})	10.24^{a}	9.71^{b}	8.64^{c}	8.80^{c}	8.93^{c}	0.15	0.04
Creatinine (mg dl^{-1})	1.10^{a}	1.20^{a}	0.88^{b}	0.93^{b}	0.90^{b}	0.09	0.03

[a, b, c, d] values within the same row with different superscripts differ significantly (P<0.05). MBD: maize based diet,
ECRLB1: ensiled cassava root-leaf blend, ECRLB2: ensiled cassava root- leaf blend + amino acids, ECRLB3: ensiled cassava root-leaf blend + enzymes, ECRLB4: ensiled cassava root-leaf blend +amino acids and enzymes.

Discussion

Improved average daily weight gain (ADWG) recorded by gilts fed ECRLB3 and ECRLB4 compared to other groups in this study may be attributed to the effect of enzyme (Allzyme® SSF) present in these diets. Enzymes have been reported to be able to breakdown the fibrous portion of the feed thereby preventing the negative influence of fibre on other constituents by releasing more nutrients for digestion and utilization (Adesehinwa *et al.,* 1998).The improved weight gain is in tandem with the report of (Akintunde *et al.,* 2011) who fed growing pigs with diet supplemented with Allzyme®. The non-significant values of feed intake reported in this study agree with Nguyen *et al.* (2011) who corroborated that ensiled cassava diets had no effect on feed intake of growing pigs. Similar feed to gain ratio observed for gilts fed the control diet (MBD) and those fed fortified diets (ECRLB 2, 3, 4) implies that the fortified diet will give the same feed to gain ratio as those fed the MBD. This further means that fortified diets can comfortably replace maize in a practical gilts diet without compromising growth performance. The worst feed to gain ratio recorded by gilts fed ECRLB1 (experimental diets without supplement) implies that cassava root-leaf blend can't comfortably replace maize unless it is fortified with various additives. The poor performance can be related to the high fibre contents of the test diets as it has been adjudged by Adesehinwa (2007) that the efficiency of protein and feed utilization decreases with increased fibre content in the diets resulting from reduced digestibility and leading to low availability of amino acids and energy of the diets, thus indicating that the blend is better utilized only when nutritionally fortified with various additives as indicated in this study. The cost benefit analysis revealed that feed cost per kg weight gain of gilts fed fortified diets were lower to those of the control group. This implies that fortified ECRLB showed better economic sense and cheaper to produce a kg weight gain than those fed the control diet.

Improved values of PCV and RBC recorded for gilts fed MBD, ECRLB2 and ECRLB4 implies that the diets did not affect the respiratory process and transportation of nutrients in the animals. According to Isaac *et al.* (2013) red blood cell is involved in the transport of oxygen and carbon dioxide in the body thus, a reduced red blood cell count implies a reduction in the level of oxygen that would be carried to the tissues as well as the level of carbon dioxide returned to the lungs. On the other hand, packed cell volume is involved in the transport of oxygen and absorbed nutrients. Similar values of Hb, MCH and MCHC were also obtained with gilts fed MBD and fortified ECRLB. This trend in the result obtained in this study could be attributed to the supplemental amino acids and enzymes added. High values of PCV, Hb and RBC have been earlier reported to suggest improved utilization for maize based diets above other diets (Irekhore *et al.,* 2015). It suffices to say that the nutrient profiles of the fortified diets were adequate to support the performance of the gilts hence the similar response recorded with the group fed the control diet. Lowered values of haematological parameters exhibited by gilts fed ECRLB1 when compared to other groups further confirm that ECRLB based diet was better utilized when fortified as indicated in the growth performance of this study. Higher WBC count obtained with this same group compared to the other groups implied lowered resistance against infectious disease conditions, stress, allergy and parasitism (Eggum, 1989).

Improved values of total protein (TP) and albumin observed with gilts fed ECRLB2 and ECRLB4 compared to the MBD was an indication that the protein contents of the diets were adequate and well utilized by the animals. This implied that the nutrient profile of the diets and feed supplements added were adequate to support the animal performance since it has been opined by Rehman and Naqvi (1979) that positive correlation existed between dietary protein intake and total serum proteins. Lowered values of serum cholesterol obtained in this study with groups fed ECRLBs compared with those fed MBD depicted that cassava was low in lipids and agrees with the earlier findings of (Adesehinwa *et al.,* 2011; Unigwe *et al.,* 2016). The lowered serum cholesterol level of pigs fed ECRLB diets suggested that the diet could be used to produce animal products with low cholesterol content. Triglyceride concentrations of gilts fed ECRLB based diets were generally higher than those fed MBD. Cassava has been said to contain more digestive starch compared to maize (Pascal-Reas, 1997) and these findings further confirmed the result. Triglycerides and glucose indicate the efficiency of utilization of metabolizable energy in a given diet (Akinfala and Tewe, 2001). The lower serum urea concentration obtained from gilts fed fortified ECRLB compared to other treatment groups was an indication of efficient utilization of the protein contained in the diets. Urea is the main nitrogenous end product arising from the catabolism of amino acids that are not used for biosynthetic roles in mammals (Orororo, 2014). Therefore, its production reflects alterations in the dietary intake of protein and pattern of utilization. Serum creatinine concentrations followed similar trend as serum urea concentration recorded in this study and is comparable to the reports of Akinfala and Tewe (2004) for growing pigs. An elevation of serum creatinine concentration is often used as an index of muscle catabolism. Lowered serum creatinine reported for gilts fed fortified ECRLB in this study indicated that there was no wasting or catabolism of muscle tissues and that the animals were not surviving at the expense of the body reserves (Ahamefule *et al.,* 2006).

Conclusion

The study concluded that fortified ensiled cassava root- leaf blends did not pose deleterious effects on the growth performance indices and blood parameters of gilts used. It is therefore recommended that fortified ensiled cassava root-leaf blend be used to replace maize at 30% in gilts' diet.

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