THE GRAIN REPLACEMENT VALUE OF SUN DRIED CASSAVA (*MANIHOT ESCULENTA* CRANTZ) LEAF + PEEL MEAL WITH OR WITHOUT DL-METHIONINE SUPPLEMENTATION ON PERFORMANCE OF RABBIT BUCKS IN THE DERIVED SAVANNAH ZONE OF NIGERIA

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Abstract

A feeding trial was conducted using Twenty four (24) cross-bred male weaner rabbits with initial weight of between 629.3–630.75 g to study the response of grower rabbits to diets that contained mixtures of cassava peel meal (CPM) and leaf meal (3:2) in replacement for maize. Three experimental diets were formulated such that diet 1 which was the control had no cassava peel/leaf meal mixture. Diet 2 had 50% maize of the control diet replaced with cassava peel/leaf meal mixture with methionine supplementation while diet 3 was similar in composition with diet 2 but without methionine supplementation. The rabbits were divided into three groups of eight rabbits each and randomly assigned to the three diets in a completely randomized design with each rabbit serving as a replicate.
Data were collected on feed intake, weight gain, feed: gain ratio, economy of production, haematological characteristics, nutrient utilization and internal organ weight.
Data were analyzed using general linear model, results showed that final live weight and average daily weight gain of diets 1 and 2 (1579.5 g, 11.21 g and 1476 g, 10.98 g) respectively were similar while the values obtained for those fed diet 3(1347.50 and 9.33 g) were significantly ($p < 0.05$) lower. Rabbits that were fed diet 1 and 2 were also superior to those fed diet 3 in terms of feed utilization as reflected in the feed: gain ratio (5.01 and 5.41 vs 6.57).
Rabbits fed CPM/CLM mixture (diets 2 and 3) had higher dry matter and crude protein digestibility than the control group. However the organ weights of the animals were not affected by the dietary treatment diets. Although the Lymphocytes, neutrophils and eusinophils values did not follow any particular trend they were significantly affected ($p < 0.05$).
Production cost was significantly ($p < 0.05$) reduced by substitutions of CPM/CLM mixture for 50% maize in grower rabbit diet when supplemented with methiomine.

Key words: rabbit buck, cassava leaf, cassava peel, methionine supplementation, performance

INTRODUCTION

Rabbit as micro-livestock is an economy animal that could bridge the wide gap in dietary protein in Nigeria. This is because rabbit is socially acceptable on the combined basis of space requirement and absence of religion taboos, as well as peculiar digestive physiology which permits the use of forages and agro-industrial by-products thus making it non-competitive species with man for cereal and legume grains. In addition rabbit can turn 20% of the protein they eat into edible meat while the value for broiler chicken is 22–23%, 16–18% for pigs and 8–12% for beef (Lebas et al., 1997 and 1986). Rabbit is prolific and has relatively low incidence of epidemic diseases when careful management is practiced with standard hygiene (IFS, 1978).

The feeding cost constitutes about 80% of the total cost of intensive production in livestock industry (Esonu, 2000; Tewe et al., 2002). Hence the focus is on alternative feed stuff which could be either substituted directly for cereals or can be included at certain level to attain a comparable production quality with the conventional cereals without deleterious effect on the animal health (Muller et al., 1974). Cassava which is widely cultivated in the tropics appears to be the best possible alternative for overcoming these chronic high feed cost in the livestock industry (Ukuchukwu, 2008). According to Tewe and Bokanga (2001), the cost of cassava products is about 40% lower than that of maize in Nigeria. However there has been increase in the demand for cassava because of its multiple uses thus leading ultimately to a great increase in the cost of cassava tuber that feeding it to livestock may not be economically justifiable. The stem, leaf and peals could therefore be used in animal feeding.

Chemical analysis shows that the peel is richer in crude protein than the pulp and is equally higher in ether extract, ash and nitrogen free extract (Omole, 1988). The leaves are however better than the both pulp and peels in terms of nutrient composition. Conversely, both the leaves and peels are high in cyanogenic glycosides (HCN) content and it is essential to detoxify them by appropriate techniques before incorporation into animal feeds.

Cassava leaf meal protein according to Yeoh and Chew (1976) is limiting in methionine and tryptophan but rich in lysine. However by the addition of synthetic methionine the biological value of the protein could be increased to 80% (Rogers and Milner, 1963; Eggum, 1970). Ravindran and Ravindran (1988) reported that the yield of cassava leaves can be as much as 4.6 tones dry matter per ha taken as a by-product of root harvest. According to Bui Van Chinh et al. (1992), in Vietnam yields of between 2.5 to 3 tones cassava leaves containing 500–600 kg dry matter and 110 to 130 kg crude protein can be obtained from 1 hectare of cassava prior to root harvesting. Cassava leaves as a protein source can be combined with low-protein cassava peels and used in rabbit feeding. Both are wastes constituting disposal problems especially where large quantities of cassava plants are harvested and processed. Methods such as ensiling and sun drying according to Ty Chhay et al. (2009) can be time consuming and in case of sun drying are difficult in the raining season. Ty Chhay (2009) has suggested that amino acid balances were probably of greater importance than presence of cyanogenic glucosides as factors limiting the utilization of this feed resource. The authors therefore concluded that it is logical to expect that provision of supplementary methionine would be beneficial in diets containing cassava leaves, as it is well established that the process of detoxification of cyanogenic glucocides causes an increase demand for sulfur contain amino acids (Maner and Gomez, 1973) or elemental sulphur (Oke, 1978). This hypothesis was supported by the report of Du Thanh Hang et al. (2006) where production performance of pigs was improved when diets with 20% fresh cassava leaves (DM basis) were supplemented with 0.2% of synthetic DL methionine.

The present study is aimed at examining the effects of combining cassava leaf and cassava peels as replacement for maize with or without DL-methionine supplementation on the performance of growing male rabbits.

MATERIALS AND METHODS

Description of experimental site

The experiment was carried out at the Rabbitry unit of the Teaching and Research Farm of Ladoke Akintola University of Technology Ogbomoso Nigeria. The study area is located between latitudes 8°07´N and 8°12´N and longitudes 4°04´E and 4°15´E. The mean annual rainfall is 1247 mm with relative humidity from between 75 to 95%. The location is situated at about 500 mm above sea level with a mean annual temperature of 26.2°C.

Source and preparation of test ingredients

Cassava peels

Fresh cassava peels from a sweet variety of cassava Tropical Manihot Species (TMS 30572) collected from the cassava processing unit of the Faculty of Agricultural Sciences of the University were rinsed in cold water to remove sand and then spread out on polyethylene sheets to sun dried for 5 days with turning twice a day at regular intervals to prevent fermentation until constant weight was obtained.

Cassava leaves

Cassava leaves were collected from freshly harvested sweet variety (TMS 30572). The leaves together with the petiole were sun dried for 5 days also till constant weight was obtained.

Preparation of experimental diets

Three (3) experimental diets were prepared with one control diet based on maize (30%) formulated to meet rabbit requirements. Two other diets were formulated by mixing the cassava peels and leaf meal in ratio 3 : 2 together to replace 50% of the maize in the control diet with or without methionine supplementation (Table 1). The diets are as follows:

Diet 1: Control (0% cassava peel/leaf meal mixtures)

Diet 2: 50% maize of control diet replaced with cassava peels/leaf meal mixtures plus methionine supplementation

Diet 3: 50% maize of control diet replaced with cassava peels/leaf meal mixtures without methionine supplementation.

The diets were pelleted using 4 mm pelleting die by extrusion method.

Experimental animals and management

A total of twenty four (24) cross bred male growing rabbits from 7 to 8 weeks of age were used for the experiment. The rabbits were all weighed and then weight-balanced such that initial average weight ranged between 629.3–630.75 g. They were then randomly assigned into 3 relative equal mean group weights of 8 rabbits per treatment with each rabbit serving as a replicate in Randomized complete design experiment.

The rabbits were housed individually on wood-wire cages measuring 44 × 34 × 44 cm. The drinking and

Tab. 1: Composition of the experimental diet

Ingredients (%)	Diets		
	1	2	3
Corn	30	15	15
CornOffal	15	25	25
Cassava Peel/leaf meal	–	15	15
Groundnut Cake	12	12	12
Soybean Meal (44%)	5	5	5
Palm Kernel Cake	15	15	15
Brewer's Dried Grain	15.25	5.25	5.45
Fish Meal (65%)	1.00	1.00	1.00
Molasses	2.80	2.80	2.80
Bone Meal	3.00	3.00	3.00
Premix*	0.25	0.25	0.25
Methionine	0.20	0.20	–
Salt	0.50	0.50	0.50
Total	100.00	100.00	100.00
Cost/kg	61.77	53.42	52.07
Metabolizale Energy (Kcal/kg)**	2568.73	2450.58	2454.54

*Premix composition/kg: vit. A 4 000 000 iu, vit. D_3 800 000 i.u, vit. E 8 000 mg, vit. B_1 1200 mg, vit. 2000 mg, Niacin 18 00 mg, calcium pantothenate 4000 mg, vit B_6 1600 mg, folic acid 400 mg, biotin 20 mg, chline chloride 120 000 mg, manganese 48 000 mg, iron 40 000 mg, Zinc 32 000 mg, Copper 3400 mg, Iodine 600 mg, Cobalt 120 mg, Selenium 48 mg, antioxidnt 48 mg **Calculated

feeding trough made of earthen pot reinforced with cement to prevent tipping-off were removable types for easy cleaning.

A total of 100 g of feed divided into two portions of 50 g in the morning (8.00 hr) and 50 g in the evening (16.00 hr) were supplied to each rabbit per day, orts were collected and weighed in order to determine feed intake. There was a constant supply of fresh water. Temperature was not artificially controlled and varied between 25 and 27°C. Humidity was not measured. There was no artificial light but minimum of 12 hour light/24 hour.

Feed intake was taken as the difference between the feed supplied and left over for each replicate per day.

The rabbits were weighed on weekly basis and weight gain for each animal per week was calculated as the difference between the present weight and the weight for the previous week. The daily weight gain was obtained by dividing the total weight gain by the number of days. Feed to gain ratio was calculated as total feed intake divided by the weight gain for each animal.

Feed cost/kg weight gain was calculated by multiplying cost/kg of feed by the feed to gain ratio.

Digestibility study

At the 7th week, feacal samples were collected for 5 consecutive days. The fresh feacal samples were weighed, sun dried and re-weighed before storing in the refrigerator. At the end of the 5th day, feacal samples for each animal were bulked and sub-sample taken for determination of proximate composition.

Haematogical studies

At the 8th week of the experiment, blood samples were collected from the rabbits via the ear vein into EDTA (Ethylene Diamine Tetra Acetic Acid) bottles to prevent coagulation. The Packed cell Volume (PCV) was determined by the micro haematocrit method according to Dacie and Lewis (1991). Haemoglobin concentration (Hb) was determined by the cyanomethaemoglobin method of Kelly, (1979). Red Blood Cells (RBC) and White Blood Cell (WBC) counts were determined using improved Neubauer haemocytometer method as described by Jain (1986). The determination of the distribution of the various blood cells was done by Shilling method of differential leukocyte counts (Mitruka and Rawnsley, 1977).

Carcass and organ evaluation

At the termination of the experiment at 8 weeks, the rabbits were tagged, starved overnight and weighed before being slaughtered. They were scalded and eviscerated to remove the internal organs for measurement. The dressed carcass as well as the internal organs were weighed and expressed as a percentage of the live weight.

Laboratory analysis

The proximate compositions of the test ingredients, experimental diets as well as that of the faecal samples were carried out using the procedure of AOAC (1990). The DM was determined by oven drying at 100°C to constant weight, Crude protein (CP) was determined by Kjeldahl method and fat by Soxhlet fat extraction method. The cyanide content of peels and diets was determined as described by Bradbury et al. (1999)

Statistical analysis

Analysis of data was done using analysis of variance with the Statistical Analysis System (SAS) 2000, employing the general linear model (GLM) procedure. Where treatment effect was significant ($P < 0.05$), differences between means were determined using the Duncan Multiple Range Test (Duncan, 1955).

Tab. 2: Chemical composition of experimental diets and test ingredients

Constituents	Diet 1	Diet 2	Diet 3	CPM	CLM	CPM/CLM
Dry Matter (%)	89.91	90.09	89.95	87.16	94.99	90.05
Crude Protein (%)	16.48	16.74	16.69	4.85	20.06	17.05
Crude Fibre (%)	8.79	8.68	8.75	15.78	10.00	11.40
Ether Extract (%)	3.56	3.52	3.68	1.65	5.82	3.82
Ash (%)	7.13	7.29	7.18	5.2	10.35	8.35
NFE (%)	60.85	60.59	60.57	59.68	48.76	49.43
HCN (Mg/kg)	0.00	8.00	9.00	20.00	50.00	28.00

CPM = Cassava peel meal; CLM = Cassava leaf meal; CPM/CLM = Cassava peel/cassava leaf meal mixture 3 : 2; NFE = Nitrogen free extract

RESULTS AND DISCUSSION

The chemical compositions of the experimental diets as well as the test ingredients are presented in Table 2. The proximate composition of the sun dried cassava peels meal (CPM) used in this study was similar to values reported by Khajaren et al. (1970), Montaldo (1977), Asaolu (1988) and Bawa et al. (1996). The cassava leaf meal (CLM) used has a high (20.06%) crude protein although with a high HCN content. The composition of CPM/CLM mixture shows that the percentage crude protein, crude fibre, ether extract, ash and NFE are 17.05, 11.40, 3.82, 8.35 and 49.43% respectively.

The proximate composition for the CLM falls within the range reported by Eggum (1990), Adewusi and Bradbury (1993) and Montaldo (1977).

The crude protein content of CPM/CLM mixture (17.5) is well above the range of 9–11% commonly reported for maize but the fibre content is higher than that of maize.

The Hydrogen cyanide (HCN) content as determined by pictrate method shows that sun dried cassava peels meal, cassava leaf meal and CPM/CLM mixtures had 20.00, 50.00 and 28.00 mg/kg respectively.

The HCN value for CPM/CLM mixtures used in formulating the experimental diet was higher than for the CPM but lower than for the CLM. The value however is less than the toxic level of 20mg/10 g by Rosling (1988).

The proximate composition of the experimental diets shows that they were iso-caloric and iso-nitrogenous. The value for crude protein falls within the range recommended for growing rabbits by Maertens and Courdet (2004), while the calculated metabolizable energy falls within the range recommended by NRC (1984).

The cyanide content of the diets show that the control had zero being the control while the diet 2 had lower value 8.00 mg/kg than diet 3 (9.00 mg/kg).

The growth performance of the rabbits fed diets containing cassava peel/leaf meal mixture with or without methionine supplementation is presented in Table 3. The final weights shows that rabbits on the control diet had weights similar to rabbits fed cassava peel/leaf meal diet with methionine supplementation whereas those

Tab. 3: Effect of dietary inclusion of cassava peels/leaf mal mixture with or without methionine supplementation on the growth performance of rabbit bucks

Parameter	Diet			SEM
	1	2	3	
Initial weight(g)	630.04	630.75	629.30	58.83
Final weight (g)	1579.5^{a}	1476.25^{a}	1347.50^{b}	53.33
Daily feed intake (g)	60.68^{a}	50.20^{b}	55.47^{ab}	2.75
Daily weight gain (g)	11.21^{a}	10.98^{a}	9.33^{b}	0.65
Feed: gain ratio	5.01^{b}	5.45^{b}	6.57^{a}	0.02
Feed cost/kg	61.77^{a}	53.42^{b}	52.07^{c}	3.60
Relative cost/kg feed (%)	100.00^{a}	86.48^{b}	84.30^{b}	7.71
Feed cost/kg weight gain (₦)*	309.46^{b}	291.13^{c}	342.09^{a}	16.10

^{ab} Means with different superscripts along the same row are significantly different ($P < 0.05$)
Diet 1 = Control diet without cassava peel/leaf meal mixtures
Diet 2 = Diet with cassava peel/leaf meal mixtures plus methionine supplementation
Diet 3 = Diet with cassava peel/leaf meal mixtures without methionine supplementation
*1 US Dollar = 150 Naira

fed diet 3, however, had significantly ($P < 0.05$) lower weight (1528 vs 1347 g LW). Similar trend was observed for the daily weight gain (11.21 vs 10.98 vs 9.33 for diets 1, 2 and 3 respectively).

The result of the study corroborate the report of Ty Chhay et al. (2009) that provision of supplementary methionine would be beneficial in diets containing cassava leaves. This is because the process of detoxification of cyanogenic glucosides causes an increased demand for sulphur-containing amino acids (Maner and Gomez, 1973) or elemental sulphur (Oke, 1978). As with live weight gain, methonine supplementation improved feed conversion in cassava peel/leaf meal based diet.

Although the voluntary feed intake for rabbits on the cassava peel/leaf meal mixture supplementation with methionine was significantly ($P < 0.05$) lower than those on the control diet and numerically lower than those rabbits fed cassava peel/leaf meal mixture without methionine supplementation, the efficiency of feed utilization measured by feed: gain ratio shows that rabbits on diet 2 had comparable value with the control but better than rabbits fed diet 3. Promkot and Wanapat (2008) had reported that increasing level of sulphur in the diet of dairy cows fed cassava foliage led to increase in voluntary intake and live weight gain. In this study, addition of methionine did not increase voluntary feed intake but led to better utilization of the diet.

It is to be noted however that there were no symptoms of ill-health and no apparent relationship between intake of HCN and production response as measured by live weight gain, feed: gain ratio and feed cost/kg gain. This result is in agreement with the reports of Du Thanh Hang and Preston (2005) and Chhay Ty and Preston (2005, 2006) that production responses in pigs fed cassava leaves are not related with levels of ingestion of HCN.

In addition, the better performance of the rabbits fed diets supplemented with methionine over the non supplemented ones could be as a result increase in the biological value of the protein in the leave resulting in much extra amino acids (Rogers and Milner, 1963; Ukachukwu, 2008). The result of this study corroborate the findings of Enriquez and Rose (1967) that 0.15% methionine supplementation of cassava based diets would significantly improve weight gain and feed conversion ratio of chicks compared to maize. Overall effects of using cassava peel/leaf meal as replacement for maize on the economics of production of rabbit buck is shown in Table 3. Cost per kg of each diet was ₦ 61.77, ₦ 53.42 and ₦ 52.07 for diets 1, 2 and 3 respectively.

On relative basis using the control (diet 1) as baseline, the cost ranged from 100% to 84.30% for Diets 1–3 respectively. This implies that the production cost/kg diet decreased with the inclusion of cassava peel/leaf meal mixtures. The addition of methionine to diet 2, however, led to a marginal increase in cost over Diet 3.

The decrease in cost per kg diet resulted from the fact that the cost of a unit of CPM/CLM mixtures is lower than the cost of a unit of maize, which the CPM/CLM replaced. This finding corroborate the report of Tewe and Bokanga (2001), that the cost of cassava products is about 40% lower than that of maize.

The cost of the cassava waste (peels and leaves) used was minimal deriving only from the cost of processing them (Ukachukwu, 2005). This mean that cassava peel/leaf meal has potential usefulness in reducing cost per kg of rabbit feed.

Cost per unit weight gain of the rabbits shows significant ($P < 0.05$) differences. Diet 3 had the highest cost/kg weight gain followed by diet 1 while diet 2 had the least. The implication of this is that it will cost ₦ 309.46, ₦ 291.13 and ₦ 342.09 to produce one kg of rabbit meat using diets 1, 2 and 3 respectively. The highest cost/kg weight gain recorded for diet 3 is attributable to its depressive effect on the performance especially the daily

Tab. 4: Effect of dietary inclusion of cassava peels/leaf meal mixture with or without methionine supplementation on hematological parameter of rabbit bucks

Parameter	Diet			SEM
	1	2	3	
Packed cell volume (%)	32	33.23	34.50	1.14
Haemoglobin (g/dl)	11.23	11.23	11.68	0.39
White Blood cells ($X10^3/mm^3$)	5.23	5.40	6.25	0.41
Red blood cells ($X10^6/mm^3$)	5.42	4.93	4.53	0.40
Lymphocytes (%)	67.50^a	50.50^b	65.00^a	3.39
Neutrophils (%)	26.50^b	43.00^a	27.00^b	3.96
Monocytes (%)	1.00	1.00	1.00	0.00
Eosinophils (%)	0.80^b	1.15^b	1.55^a	0.14

^{ab}Means within the same row carrying different superscript are significantly different ($P < 0.05$)

Tab. 5: Effect of dietary inclusion of cassava peels/leaf meal mixture with or without methionine supplementation nutrient digestibility of rabbit bucks

Parameter (%)	Diet			
	1	2	3	SEM
Dry matter digestibility	83.12[a]	73.79[b]	72.70[b]	1.50
Crude protein digestibility	81.80[a]	76.86[b]	72.88[b]	1.30
Crude fibre digestibility	46.78	41.36	33.06	0.96
Nitrogen free extract digestibility	94.07	90.15	89.31	0.68
Ether extract digestibility	87.49	82.22	88.64	0.96

[ab]Means with different superscript along the same row are significantly different ($P < 0.05$)

weight gain and the feed: gain ratio. On the other hand the higher cost per kg weight gain of the diet 1 arose from the high cost of the diet per kg. Obioha (1975) and Pido et al. (1974) recorded considerable decrease in feed cost due to incorporation of cassava product in livestock feed. Earlier, Seerley (1972) and Muller et al. (1974) had advocated for the use of cassava products in livestock feed especially in geographical areas where cassava can be obtained cheaply. The result of this study corroborated their findings. There was better feed utilization in rabbits fed cassava peel/leaf meal mixtures plus a supplementation with methionine thus proving its effectiveness in counteracting the negative effect that HCN may have on the rabbits.

The haematological parameters of the rabbits fed the cassava peel/leaf meal mixtures based diets is presented in Table 4. There were no significant ($P > 0.05$) differences between the treatment in all parameters measured except in the lymphocytes, Neutrophils and Eosinophils values. The lymphocyte values for diets 1 (Control) 67.50 and 3 (CPM/CLM – Methionine) 65.00% were higher ($P < 0.05$) than the value (50.50%) for diet 2 (CPM/CLM + Methionine).

The Eosimophil values for diets 1 (0.80%) and 2 (1.15%) were similar ($P > 0.05$) but higher ($P < 0.05$) than the value (1.55%) obtained for rabbits on diet 3. According to Oyawoye and Ogunkunle (1998), haematological components of blood are valuable in monitoring feed toxicity especially with feed constituents that affect the formulation of blood.

The higher hymphocytes values for diets 1 and 3 suggest that these diets may provide better level of immunity in rabbits (Ezema et al., 2008). The eosinophilic population was significantly reduced in rabbits fed diets 1 and diets 3.

Kelly (1967) and Kelly (1979) has attributed neutropenia to early feature in stress syndromes. The reason for this could not be explained for the control diet however the effect of higher level of cyanide in diet 3 than in diet 2 may be the reasons for the reduced neutrophilic value in rabbits fed diet 3 (cassava peel/leaf meal without methionine supplementation).

The higher ($P < 0.05$) neutrophilic values of rabbits on diet 2 (CPM/CLM + Methionine) suggest higher immunity status against infection. The inclusion of methionine to this diet may have resulted in higher amino acid profile and hence better nutrition that enabled the rabbits built better immunity.

The nutrient digestibility of experimental is presented in Table 5. Apart from dry matter digestibility and crude protein digestibility that were significantly ($P < 0.05$) affected by the dietary inclusion of cassava peel/leaf

Tab. 6: Effect of dietary inclusion of cassava peels/leaf meal mixture with or without methionine supplementation on organ weights of rabbit bucks

Parameters*	Diet			
	1	2	3	SEM
Heart weight	0.25	0.21	0.23	0.01
Pancreas weight	0.06	0.07	0.06	0.01
Lungs weight	0.40	0.46	0.48	0.02
Spleen weight	0.04	0.06	0.06	0.01
Kidney weight	0.54	0.60	0.53	0.03
Liver weight	2.86	2.82	2.80	0.11

*Percentage of live weights

meal mixtures, other parameters (crude fibre, ether extract and nitrogen free extract digestibilities) were not affected (P > 0.05). The dry matter digestibility for the rabbits on the control diet (83.12%) was significantly (P < 0.05) higher than the values for diet 2 (73.79%) and diet 3 (72.70%) that were similar. The same trend was observed in crude protein digestibility. This may be as a result of residual cyanide in both diet 2 and 3 thus implying the possibility of cyanide in reducing both dry matter and crude protein digestibility.

The effects of dietary inclusion of cassava peel/leaf mal mixture with or without methionine supplementation on organ weights of rabbit buck is presented in Table 6. All the organs measured were not affected (P > 0.05) by the dietary treatments, which suggests the safety of the test ingredients as non-conventional feed stuffs capable of reducing cost of production in rabbit.

CONCLUSION

There were no differences (P > 0.05) in growth performance between the control diet and the cassava waste based diet with DL-methionine supplementation. This implies that there is nutritional benefit from DL-methionine supplementation of rabbit diet containing cassava peel/leaf meal because of the relative deficiency of the sulphur amino acids in cassava leaf protein and the fact that the source of sulphur is required for the detoxification of HCN. Thus, CPM/CLM mixtures has potential usefulness in reducing cost/kg of rabbit feed which ultimately will mean more income for the farmer.

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