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Proximate composition, haematology, carcass characteristics and meat yield of growing rabbits fed yam-cassava peel composite meal as a replacement for maize

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Abstract

Yam and cassava peels are by-product resulting from processing of yam and cassava for domestic cooking and other purposes which represent unutilized energy sources in many parts of the country because they have limited or no human food value. It's in view of the need for waste management and upsurge in prizes of conventional feeds (maize) with their increasing demand that necessitate, the need for waste peels from either yam or cassava which are largely discarded thereby constituting environmental nuisance to be used as ingredient (unconventional feedstuffs)in replacing maize(conventionalfeedstuff) as energy source for animal feeding.This study was therefore carried out to investigate the effect of replacing maizewith yam-cassava peel composite meal on haematology, carcass characteristics and meat yield of growing rabbits in 84-days feeding trial. Thirty-six weaner rabbits of mixed sex and strain and average initial weight of 500.89g were randomly allotted to six dietary treatmentsSix dietary treatment were formulated such that, Diet 1 (T1) contained maize and the proportion of maize in diet 1 (T1) was replaced with yam-cassava peel composite meal (YCPCM) in a ratio of 6:1 at 20, 40, 60, 80 and 100% in diet 2(T2), 3(T3), 4(T4), 5(T5) and 6(T6) respectively. Weighed amounts of feed were served every morning while fresh, cool and clean drinking water was provided ad-libitum and data were collected for proximate composition of yam cassava composite peel meal as well as the haematological profile of growing rabbits and carcass and meat yield. Proximate composition of YCPM revealed 89.60% dry matter (DM), 10.22% crude protein (CP), 14.29% crude fibre (CF), 1.27% ether extract (EE), 6.25% total ash (TA), 67.57% nitrogen free extract (NFE) and 2920.24kcal/kg metabolizable energy (ME Results on carcass characteristics and meat yield of growing rabbits indicated no significant ($P>0.05$) difference on all the parameters measured. Significant ($P<0.05$) difference occurred in some haematological (PCV, RBC, Hb, MCV and MCH) within the normal range of recommendation for healthy rabbits to it external and internal environment. This suggests that, 100%inclusion of YCPCM in diets of growing rabbits has no adverse deleterious effect on haematology, carcass characteristics and meat yield of growing rabbits.

Keywords: Yam-Cassava peel composite meal, proximate composition, haematology, carcass characteristics and meat yield, growing rabbits

Composition proximité, hématologie, caractéristiques de la carcasse et rendement de la viande de la caution de lapins nourris à l'igname et le repas composite de manioc à peler comme remplacement pour le maïs

Résumé

Les peaux d'igname et de manioc sont des sous-produits résultant de la transformation de l'igname et du manioc pour la cuisson domestique et d'autres fins qui représentent des sources d'énergie inutilisées dans de nombreuses régions du pays car elles ont une valeur alimentaire limitée ou sans alimentation humaine. C'est compte tenu de la nécessité de la

gestion des déchets et de la recrudescence dans les prix des aliments conventionnels (maïs) avec leur demande croissante qui nécessitent, la nécessité de détester des déchets de l'igname ou de la manioc qui sont largement rejetées, constituant ainsi une nuisance environnementale à utiliser comme ingrédient (Les aliments non conventionnels) dans le remplacement du maïs (alimentation conventionnelle) comme source d'énergie pour l'alimentation des animaux. Cette étude a donc été réalisée pour étudier l'effet du maïs avec la peau d'igname et manioc composite Repas composite sur l'hématologie, les caractéristiques de la carcasse et le rendement de la viande de la caisse de culture en 84-Essai d'alimentation des jours. Trente-six lapins de merveilles de sexe mixtes et de souches et de poids initial moyen de 500,89 g ont été alloués au hasard à six traitements diététiques. Régime alimentaire 1 (T1) contenait du maïs et la proportion de maïs dans le régime alimentaire 1 (T1) a été remplacé par un repas composite de pelage L'igname-manioc (RCPIM) dans un ratio de 6: 1 à 20, 40, 60, 80 et 100% dans le régime alimentaire 2 (T2), 3 (T3), 4 (T4), 5 (T5) et 6 (T6) respectivement. Des quantités pesées d'aliments d'alimentation ont été servies tous les matins, tandis que de l'eau potable fraîche, fraîche et propre a été fournie à l'ad-libitum et les données ont été collectées pour une composition proximité de la plate-forme de pelage composite de Cassava Yam, ainsi que du profil hématologique de la culture de lapins et de la carcasse et de la viande. Composition proximité de la RCPIM a révélé 89,60% de matière sèche (MS), 10,2% de protéines brutes (PB), 14,29% de fibres brutes (FB), de 1,27% d'extrait d'éther (EE), de 6,25% de cendres totale (CT), 67,57% d'extrait d'azote sans azote (EAA) et 2920.24KCAL / kg d'énergie métabolisable (moi entraîne des caractéristiques de la carcasse et du rendement de la viande de lapin de culture indiquée aucune différence significative (p> 0.05) sur tous les paramètres mesurés. La différence significative (p <0,05) s'est produite dans certaines hématologiques (VCE , HGR, HB, MCV et MCH) dans la gamme normale de recommandation pour les lapins sains à l'environnement externe et interne. Cela suggère que 100% l'inclusion de RCPIM dans des régimes de lapin de culture n'a aucun effet néfaste sur l'hématologie, les caractéristiques de la carcasse et Rendement de la viande de rapbits en croissance.

Mots-clés: Repas composite de pelage L'ignmae-manic , composition proximité, hématologie, caractéristiques de la carcasse et rendement de la viande, de lapins en croissance

Introduction

Low animal protein intake has remained a major nutritional problem for the low income and non-wage earners (Uchewa *et al*., 2014). Rabbit's rapid rate of reproduction withshort gestation period (28-32 days) has made its production a wise choice for as a means of alleviating protein food shortages. It's also favoured because of its high fecundity, low cost of investment and ability to utilize diverse forages (Taiwo*et al*., 2014; Uchewa *et al*., 2014). Rabbit meat is known to contain high quality and quantity of protein (20.8%), less fat (10.2%) than other meat specieswith high proportion of polyunsaturated linoleic and linolenic fatty acids (Gbenge *et al*., 2021). In spite of these advantages, rabbit production has not received the desired attention in the tropics (Cheeke, 1992; Ogunsipe and Agbede, 2012; Gbenge and Ikurior, 2019). This has been attributed to escalating prices of conventional feed ingredients especially the energy sources such as maize, sorghum etc. (**Garba, and Mohammed, 2015;** Akinmutimiand Anakebe, 2008). In view of this, there is increased interest by Nigerian livestock farmers to harness unconventional feed ingredients such as yam and cassava peels which are readily available with little cost

and non-competitive feed materials that can be developed as components of animal feeds (Ogbuewu *et al.,2010;* Ayoola and Akinbani, 2011; Uchewa *et al*., 2014; Ekpo *et al*., 2015; Garba and Mohammed, **2015;** Taiwo *et al*., 2014).

Yam and cassava peels are by-product resulting from processing of yam and cassava for domestic cooking and other purposes which represent unutilized energy sourcesin many parts of the country because they have limited or no human food value (Oluremi and Nwosu, 2002; Akinmutimi *et al*., 2006; **Gbenge *et al*., 2021**). Yam peel and cassava peel is described by Akanno (1998) and Orororo *et al.* (2014) to contain 2604kcal/kg and 2551.69kcal/kgME while Gbenge *et al.* (2021) reported 10.22% CP, 14.29%CF and 2416.94kcal/kgME of yam-cassava peel composite meal.This study was aimed at investigating the effect of replacing maize with yam and cassava peel meal composite on haematology and carcass characteristics of growing rabbits.

Materials and methods

Experimental site and location

The experiment was conducted at the Rabbit Unit of the Livestock Teaching and Research Farm, College of Animal Science, Joseph SarwuanTarka University Makurdi, Benue State, Nigeria. Makurdi is located between latitude 17°14'N and longitude 8° 21'E in the Guinea Savanna Zone of West Africa. It has a tropical climate with distinctive wet and dry season (TAC, 2004). The area has an annual rainfall of 6-8 months (March – October) with rainfall ranging from 508 to 1016 mm with a minimum temperature range of 24.20 ± 1.4^{0}C and maximum temperature range of 36.33 ± 3.70^{0}C. The relative humidity ranges between 39.50 ± 2.20% and 64.00 ± 4.80% and between 00mm to 100mm above sea level (TAC, 2004).

Collection and preparation of yam and cassava peels

The test ingredients, fresh yam (*Dioscorea spp*) and cassava (*Manihot spp*) peels were collected from fast food and garri processing joints within Makurdi Metropolis and it environ. The freshly collected yam and cassava peels were thoroughly washed to remove sand and other unwanted materials and soaked for twelve hours (12 hrs) in cool and clean water according to Olurotimi *et al*. (2012), Ajuonuma and Uchendu (2013), Oloruntola *et al*. (2016) and Gbenge *et al*. (2021). The soaked yam and cassava peels were immediately removed after twelve hours of soaking, drained with a basket and subsequently sun-dried on concrete platforms to attain less than 10% moisture. The soaked and sun-dried yam and cassava peel were turned two-to-three (2-3) times per day to ensure uniformity of dryness and the dried peels were packed and stored in polythene bags. The peels were then milled to obtain yam peel meal and cassava peel meal which was later mixed with other feed ingredients to produce the experimental diets.

Experimental design and management of animals

A total of 36 weaner rabbits of mixed sex and strain and aged (4-7 weeks) with initial weight range of 336 - 701g were obtained from local farms within Makurdi town and used for the study. They were randomly allotted to six dietary treatments according to live weights with six rabbits per treatment in a complete randomized design (CRD) with each treatment, replicated six times with one rabbit per replicate. The animals were individually housed in cages and each cage was supplied with a drinker and plastic feeder, both of which were firmly fixed to prevent being tipped over during feeding and water intake. Prior to commencement of the experiment, the cages were well cleaned and disinfected with saponatedcreso (Izal) and allowed to dry for seven (7) days before the rabbits

were introduced therein. The rabbits were also condition for seven days (7) to facilitate adaptation and to acclimatize the new environment before commencement of the experiment. During this period of adaptation and to acclimatization, they were fed commercial ration (grower's mash) and water *ad-libitum.* The rabbits were also treated against external and internal parasites by subcutaneous injection of ivomectin at 0.2ml per rabbit prior to commencement of the experiment. A broad spectrum antibiotic (water soluble powder) and protective, absorbent anti-diarrhoea (dry suspension) were used in drinking water against bacterial infection.

Experimental diets and feeding

Ingredients and nutrient composition of each dietary treatmentareshown in Table 1. Six dietary treatments were designated as T_1, T_2, T_3, T_4, T_5 and T_6. The six dietary treatments were formulated such that, diet 1 (T_1) served as control with maize as the major energy source. The proportion of maize in diet 1 (T_1) was replaced with soaked and sun-dried yam and cassava peel meal mixed in a ratio of 6:1 in diet 2 (T_2), 3 (T_3), 4 (T_4), 5 (T_5) and 6 (T_6) at 20, 40, 60, 80 and 100% respectively. Weighed feeds (100g) were served to the experimental animals every morning with fresh, cool and clean drinking water *ad-libitum*.

Data collection and analysis

Proximate composition of the test ingredient (yam-cassava peel composite meal)

The samples of soaked and sun-dried yam and cassava peel composite meal mixed at a ratio of 6:1 was analyzed for proximate composition using the standard methods (AOAC, 2006) at the Animal Nutrition Laboratory, Department of Animal Nutrition, Federal University of Agriculture, Makurdi, Benue State.

Table 1: Percentage ingredients and calculated nutrient composition of each dietary treatment

Paramenters	Experimental diets					
	T_1 (Control)	T_2 20%YCPCM	T_3 40%YCPCM	T_4 60%YCPCM	T_5 80%YCPCM	T_6 100%YCPCM
White maize	40.63	32.50	24.38	16.25	8.13	-
Yam peel meal	-	6.97	13.93	20.90	27.86	34.83
Cassava peel meal	-	1.16	2.32	3.48	4.64	5.80
Fullfat soya bean meal	14.37	14.37	14.37	14.37	14.37	14.37
Groundnut cake	12.00	12.00	12.00	12.00	12.00	12.00
Rice husk	25.00	25.00	25.00	25.00	25.00	25.00
Brewers dry grains	5.00	5.00	5.00	5.00	5.00	5.00
Bone meal	2.50	2.50	2.50	2.50	2.50	2.50
Premix*	0.25	0.25	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25	0.25	0.25
Coccidiostat[a]	+	+	+	+	+	+
Total	100	100	100	100	100	100
Calculated analysis						
Crude protein (%)	16.49	16.46	16.44	16.42	16.39	16.37
Crude fibre (%)	12.53	12.99	13.45	13.91	14.37	14.83
Lysine (%)	0.70	0.69	0.67	0.65	0.63	0.61
Methionine (%)	0.24	0.22	0.21	0.20	0.18	0.17
Calcium (%)	1.13	1.13	1.14	1.14	1.14	1.14
Available P. (%)	0.64	0.63	0.63	0.62	0.62	0.61
ME (kcal/kg)	2615.62	2581.54	2547.51	2523.63	2479.39	2445.32

**To provide the following per kg of diet; vitamin A – 15,000.00IU, Vitamin D3 - 3, 000,000IU, Vitamin E-30,000IU, Vitamin K – 3,000mgVitamin B1 3000,mg Vitamin B2 -6000mg, Vitamin B - 5,000mg, Vitamin B12-40mg, Biotin 200mg, Niacin -40,000mg, Pantothenic acid 15,000mg,Folic acid 2,000mg, choline 300,000mg,Iron 60,000mg, manganese 80,000mg, copper 25,000mg,Zinc 80,000mg cobalt 150mg, iodine 500mg,selenium 310mg, Antioxidant 20,000mg.*

[a(+)]Administered in water at 0.5g/l per rabbit (weekly) to prevent intestinal coccidiosis

YCPM=Yam-cassava Peel Meal and P.=Phosphorus

Blood constituent evaluation

At the end of the feeding trial and during carcass evaluation, blood samples were randomly collected from three rabbits out of the four rabbits per treatment and the samples were analyzed for haematological indices. About 5mL of blood sample was collected through the bleeding veins of each rabbit at slaughtered into labeled sterile bottles containing ethylene diaminetetra acetic acid (EDTA) which served as anticoagulant. Haematological indices were determined as red blood cell count (WBC), white blood cell count (RBC), haemoglobin concentration (Hb) and packed cell volume (PCV). RBC, WBC, Hb, PCV, mean corpuscular haemoglobin concentration (MCHC), mean corpuscular volume (MCV) and mean haemoglobin concentration (MHC) according to Jain (1986). Kelly (1979) while neutrophils, basophil, monocytes, lymphocytes and Eosinophil determination of the distribution of various cells was done by shilling method of differential leucocyte count (Mitruka and Rawnsley, 1977).

Carcass characteristics and meat yield

At the end of the experiment, four rabbits per treatment were randomly selected, fasted for twelve hours (12 hrs) to clear the gut before slaughtering as described by Akinmutimi and Osuagwu (2008) and then, weighed to obtained live body weight. Each rabbit was stunned by hand blow at the base of the neck and killed by severing the jugular veins according Shaahu *et al.* (2014) and bled under gravity by hanging through their hind limb using wire net. The rabbits were singed, eviscerated and weighed using a meter B12001 electronic weighing balance and carcass dressing percentage were calculated as follows;

Dressing percentage (%) =

$$\frac{\text{Dressed carcass weight}}{\text{Live body weight}} \times 100$$

Statistical analysis

All data collected were subjected to one-way analyses of variance (ANOVA) using SAS (2008). Where ANOVA indicate significance difference between treatment effects, mean were separated using Duncan new multiple range test (Steel Torrie, (1990). All statements of significance were based on 5% level of probability ($p<0.05$).

Results

The proximate composition of yam-cassava peel composite meal (YCPCM)

Table 2 shows the percentage composition of dry Matter (89.60), Crude Protein (10.22), Crude Fibre (14.29), Ether Extract (1.67), Ash (6.25) and Nitrogen Free Extract (67.57) of the test ingredient (yam-cassava peel composite meal).

Haematological profile of growing rabbits fed experimental diets

The haematological parameters of growing rabbits fed control diet and graded levels of YCPCM are presented in Table 3. The results obtained in this study showed that, WBC, MCHC, Lymphocytes, neutrophil, basophil and monocytes were not significantly ($P>0.05$) differentacross all the dietary treatments in growing rabbits while significant ($P<0.05$) differences were observed on mean values of PCV, RBC, Hb, MCV and MCH across the dietary treatments.

Carcass characteristics and meat yield of growing rabbits fed experimental diets

The results of the carcass characteristics and meat yield of growing rabbits are presented in Table 4. Results obtained within the group of growing rabbits fed YCPCM based diets showed that, there were no significant ($P>0.05$) differences in means of all the carcass characteristics measured such as; live weight, eviscerated weight, singed weight, dressed weight and dressing percentage.

Table 2: Proximate composition of test ingredient (YCPCM)

Parameters	YCPCM (Yam Cassava Peel Composite Meal)
Dry matter (%DM)	89.60
Crude protein (%CP)	10.22
Crude fibre (%CF)	14.29
Ether extract (%EE)	1.67
Total ash (%TA)	6.25
Nitrogen free extract (%NFE)	67.57
ME (kcal/kg)	2920.24

Metabolizable Energy (ME) = calculated according to the formula of Pauzenga (1985) whileNFE) was also calculated as described by Association of Official Analytical Chemists (2006), ME= 37×%CP+81.8×%EE+35.6×%NFE while %NFE = 100 – (%CP + %CF + %EE + %Ash). ME and %NFE as referenced by Etuk *et al*. (2102); Igwebuike *et al.* (2013a); Shaahu *et al.* (2014); Madziga *et al*. (2017).

Table 3: Haematological profile of growing rabbits fed experimental diets containing graded levels of YCPCM

	Experimental diets						
Parameters	T_1	T_2	T_3	T_4	T_5	T_6	SEM
No. of rabbits	3	3	3	3	3	3	
PCV (%)	49.00^{a}	47.33^{ab}	46.00^{ab}	47.33^{ab}	45.33^{ab}	43.67^{b}	0.573^{*}
RBC ($\times10^{12}$/l)	5.57^{a}	6.23^{a}	6.03^{a}	6.17^{a}	4.53^{b}	4.37^{b}	0.201^{*}
WBC ($\times10^{9}$/l)	4.67	6.27	5.20	4.07	4.00	4.40	0.422^{NS}
Hb (g/dl)	16.33^{a}	15.80^{ab}	15.33^{ab}	15.77^{ab}	15.40^{ab}	14.63^{b}	0.178^{*}
MCV (fl)	88.33^{a}	79.20^{ab}	81.23^{a}	79.67^{ab}	70.13^{bc}	64.77^{c}	2.151^{*}
MCH (pg)	29.47^{a}	26.43^{abc}	27.10^{ab}	25.77^{bc}	23.17^{cd}	21.77^{d}	0.720^{*}
MCHC (g/dl)	33.30	33.37	33.33	33.33	33.27	33.53	0.041^{NS}
		Leucocyte differential counts (%)					
Lymphocytes	64.67	64.67	65.00	64.67	64.33	64.33	0.641^{NS}
Neutrophil	28.00	30.33	29.67	29.00	30.00	33.00	0.551^{NS}
Eosinophil	1.67	1.67	1.00	2.67	2.00	1.00	0.268^{NS}
Basophil	0.00	0.00	0.33	0.33	0.00	0.00	0.076^{NS}
Monocytes	4.67	3.00	3.67	3.00	3.67	3.00	0.424^{NS}

Means on the same row with different superscripts differs significantly ($p<0.05$), NS = No significant ($p>0.05$) difference, SEM = Standard error of mean,* = Significant ($p<0.05$) difference, PCV= Packed cell volume, RBC= Red blood cell count, WBC= White blood cell count, Hb=Haemoglobin concentration, MCV= Mean corpuscular volume, MCH= Mean corpuscular haemoglobin and MCHC= Mean corpuscular haemoglobin concentration, T_1= Control diet containing 0%YCPCM , T_2= Diet containing 20%YCPCM , T_3= Diet containing 40%YCPCM , T_4= Diet containing 60%YCPCM , T_5= Diet containing 80%YCPCM , T_6= Diet containing 100%YCPCM, YCPCM = Soaked and Sundried Yam-Cassava Peel Composite Meal

Table 4: Effect of experimental diets on carcass characteristics and meat yield of growing rabbits

	Experimental Diets						
Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**	**SEM**
Live weight [LW](g)	1186.50	1107.75	1216.50	1177.00	1185.75	1173.50	36.593^{NS}
Eviscerated weight (g)	834.50	768.50	848.75	826.25	808.00	787.25	27.434^{NS}
Singed weight (g)	738.50	674.00	739.25	661.00	702.75	689.75	27.161^{NS}
Dressed weight [DW](g)	612.25	558.50	634.00	615.25	582.25	567.00	23.831^{NS}
Dressing percent (%)	51.60	50.42	51.29	52.27	49.10	48.32	0.653^{NS}

SEM = Standard error of mean, NS = No significant ($p>0.05$) difference, % = Percent and g = grams, T_1= Control diet containing 0%YCPCM, T_2= Diet containing 20%YCPCM, T_3= Diet containing 40%YCPCM, T_4= Diet containing 60%YCPCM, T_5= Diet containing 80%YCPCM, T_6= Diet containing 100%YCPCM, YCPCM = Soaked and Sundried Yam-Cassava Peel Composite Meal

Discussion

Proximate composition of test ingredient (YCPCM)

Result of this study on metabolizable energy (ME)value of 2920.24 kcal/kgME is similar to the reported values of 3000 kcal/kg but lower than 3690.73 kcal/kg ME values of Yam peel meal obtained by Ekenyem *et al*. (2006); Uchewa *et al*. (2014) and Lawal *et al*. (2017) and 3346.90 and 3380.15 kcal/kg dry matter ME obtained by Oluremi and Nwosu (2002) in unsoaked and five hours soaked and sun-dried cassava peel meal but higher than 2604 kcal/kg and 2551.69kcal/kg ME values of yam peel meal and cassava peel meal obtained by Akanno (1998) and Orororo *et al.* (2014). The ME value of this study is higher tha the opined value of 2416.24 kcal/kg ME of yam-cassava peel composite meal obtained by Gbenge *et al.* (2021). The crude protein (CP) of 10.22 % of the test ingredient (YCPCM) is similar to the CP in maize, a conventional energy feedstuff with CP content of 9.25, 10.10 and 10.65% reports by Tuleun *et al*. (2005); Igwebuike *et al*. (2013a) and Gbenge and Ikurior (2019)**.** Crude fibre (CF) content of 14.29 % in this study is higher than the reported values (12.57, 10.98, 8.89 and 8.54%) of Olurotimi *et al.* (2012) in cassava peel meal using different processing methods (unprocessed, sundried, ensiled and retted) and 12.24% CF value of sundried yam peel meal has also been reported by Omole *et al*. (2013).

The percentage total ash (TA) content of 6.25 obtained in this study is slightly lower than the opined value of 6.80% TA by Ekenyem *et al. (2006)* for yam peel meal and 7.30 and 7.26% by Ekpo *et al*. (2015) for yam peel meal and cassava peel meal but higher than the reported values of 5.61 and 5.32% for rumen liquor fermented cassava peels and sundried cassava peel. The level of ash content in this study suggests that, it is a good source of mineral elements which is needed for proper fluid balance, healthy bones and teeth formation. However, the nitrogen free extract (NFE) of 67.57% in this study is higher than the value obtained by Omole *et al*. (2013) and Uchewa *et al*. (2014) in yam peel meal and Oluremi and Nwosu (2002) in unsoaked and water soaked cassava peel meal but lower than those obtained by Oloruntola *et al*. (2016) in cassava peel meal similar to values obtained byEkpo *et al*. (2015) in yam and cassava peel meal. The NFE value of 67.57% implied that, YCPM has a high level of soluble carbohydrate and will enhance palatability and therefore, increase feed intake and digestibility (Uchewa *et al.,* 2014).

Haematological profile of growing rabbits fed experimental diets

The mean of haematological values of PCV, RBC, Hb, MCV and MCH obtained in this study differed significantly ($p<0.05$) except WBC, MCHC, Lymphocytes, neutrophil, basophil and monocytes which differed not significantly ($P>0.05$) across all the dietary treatment groups and within the normal range for a healthy physiological responsiveness of rabbits to its internal and external environments (Anon, 1980; Poole, 1987; Hewitt *et al.*, 1988; RAR, 2009;Etim and Oguike, 2011; Moore *et al.,* 2015; Henry *et al.,* 2017, Ogunsipe *et al*., 2017). As shown in this study, most of the haematological parameters measured were not significantly affected by the dietary treatment groups suggesting that, the haematopoietic activities were enhanced identical by the dietary treatments and by extension, the health status of the rabbit were not compromised by replacing maize with YCPCM in the diets of growing rabbit thus, all blood parameters reported for haematological parameters fells within the normal range of reports by Mitruka and Rawnsley, (1977); Anon. (1980); Hewitt*et al.* (1988); PGCVS (2009); RAR (2009); Medirabbbit (45) and Moore *et al.* (2011).

Carcass characteristics and meat yield of growing rabbits fed experimental diets

Results obtained within groups of growing rabbits fed control and YCPCM based diets showed no significant (P>0.05) difference in means of carcass characteristics and meat yield. This confirmed the report of Uchewa *et al.* (2014) who opined no significant (P>0.05) difference in means of wholesale and carcass yield within the groups of growing rabbits fed yam peel meal based diets and control. It is however in consonance with Oluremi and Nwosu (2002) who reported non-significant difference (P>0.05) in growing rabbits fed cassava peels. Igwebuike *et al.* (2013) reported a similar trend (no significant difference) in mean of growing rabbits fed replacement levels of wheat offals with sorghum offal. Ogunsipe and Agbede (2012) and Orayaga *et al*. (2017) observed no significant (P>0.05) difference in means of wholesale and carcass cut (retail cuts) with exception of the head within groups of growing rabbits fed millet offals and mango fruits reject peel meal based diets. This implied that, the diets had no adverse effect on the carcass traits of growing rabbit and the treatment groups had good edible carcass parts (Garba and Mohammed, 2015). A similar report of significant (P<0.05) difference effect in mean of live weight has been posited by Akinmutimi and Osuagwu (2008) and Makinde *et al*. (2017) on growing rabbits fed sweet potato peel meal and different agro-industrial by-products in places of maize. Significant (P<0.05) difference effect has also been reported by Ekenyem *et al.* (2006) and Akinmutimi and Onen (2008) in finisher broiler chickens fed yam peel meal as replacement for maize which disagreed with this study.Result on mean of SW is supported with the opined reports of Ogunsipe and Agbede (2012); Sogunle *et al*. (2014) and Orayaga *et al*. (2017). The mean of dressed weight (DW) revealed no significant (P>0.05) difference with highest and least value at T3 (634.00g) and T2 (558.50g). This implied that, the test diet 3 (T3) supported the deposition of tissues for DW than the control and other YCPCM based diets. Thus, T3 performed better than the control and other YCPCM based diets as evidence in carcass characteristics of LW, EW and SW. The observed findings of this study could be attributed to the variation in final live weights of experimental rabbits which was numerically highest in rabbits fed T3 based diet. This numerical increased buttressed Oloruntola *et al*. (2016) and Akinmutimi *et al.* (2006) in growing rabbits fed yam peel meal based diets. The non-significant (P>0.05) difference in mean of DW also agreed with Uchewa *et al*., 2014) in weaned rabbits fed fermented rumen liquor cassava peel meal and yam peel meal as replacement for maize. The dressing percentage range of 48.32 - 52.27% obtained in this study fells within the normal range of dressing percentage of rabbit of 50-57% as reported by Aduku and Olukosi (1990) with exception of T5 and T6 which wereslightly below the opined ranged. Growing rabbits fed T4 had higher value of 52.27 with a numerical decreased from T4 (52.27) to T6 (48.32) compared to control (51.60) diet. These variations could be attributed to the differences in some factors such nutrition/treatment, age, breeds, final live weight, bled weight and slaughtering weights of the experimental rabbits among other factors. Result of this study is supportedby the works of Ayoola and Akinbani (2011);Ogunsipe and Agbede (2012) and Igwebuike *et al*. (2013b) but not in consonance with Akinmutimi and Osuagwu (2008) and Oloruntola *et al*. (2016). Oluremi and Nwosu (2002) reported non-significant (P>0.05) difference in dressing percentage of rabbits

fed cassava peels. The non-significant (P>0.05) difference effect on dressing percent of the experimental diets across all the treatment groups is an indication that, all the experimental diets were effectively utilized and either of them can be recommended for weaned/growing rabbits.

Conclusion/recommendation

Results of this study indicated that, YCPCM is a good alternate feedstuff in replacing maize as energy source and100% replacement level had no deleterious effect on haematological indices, carcass characteristics and meat yield of growing rabbits which warrant its recommendadation as feed source in rabbit diets. However, further study is required to determine other appropriate processing methods of YCPCM that will enhance its potential as feed resource in monogastric animal production(e.g; broilers, quails, ducks etc).

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