EFFECT OF FERMENTED CASSAVA ROOT-LEAF BLEND ON CAECAL MICRO-FLORA OF WEANED RABBITS.

Mafimidiwo, A.N, Olayemi, W.A, Adebayo, B.J, Omofunmilola, E.O, and Awoh, C.D
[1]Department of Agricultural Technology, Yaba College of Technology, Yaba, Lagos
Please the authors list have been changed during the corrections to:
*Correspondence author: ayotunde.mafimidiwo@yabatech.edu.ng Tel. +2348023024349.

ABSTRACT

The effect of fermented cassava root-leaf blend on caeca microflora of weaned rabbits was investigated in a 56days feeding trial. The experiment was conducted using Fermented Cassava Root-leaf Blend (FCRLB) to replace maize in the diets of weaned rabbits. Forty unsexed New Zealand white rabbits of weight range 700-800g were allotted into five dietary treatments on weight equalization basis. A standard basal diet (100% maize) served as the control while other diets had maize replaced with FCRLB at four other levels (25, 50, 75 and 100%). Eight rabbits were used per treatment which had four replicates of two rabbits each in a completely randomized design arrangement. The results shows a higher *Staphylococcus* and *Pseudomonas* counts in rabbits fed diet containing 75% FCRLB while rabbits on 75% FCRLB had the highest *Pseudomonas, Staphylococcus, Streptococcus, Escherichia coli* and *Salmonella* counts. *Salmonella* in isolation (1.8×10^4 cfu/ml) count were observed in diet having 75% FCRLB. However, the control diet (0% FCRLB) had the highest count of *Bacillus*. E. *coli* counts were isolated (1.9×10^4) in diet containing 75% FCRLB. *Klebsiella oxytoca* were found only in the caecum of rabbits fed diets containing 50 and 100% FCRLB. The research concluded that a gut stabilizing effect which connotes improved nutrient digestibility can be obtained from replacing maize at 75% with fermented cassava root-leaf blend in the diet of weaned rabbits.**Keywords**: Fermented, microflora, weaned, leaf-blend, rabbits

INTRODUCTION

Rabbit production became very popular as a result of its prolificacy and short gestation period (Ajani *et al.,* 2020). Its low cholesterol meat coupled with a high efficiency of transforming farm waste to meat (Mafimidiwo *et al.,* 2022) ranked it among the meat for the future. Although rabbit subsist mainly on forages yet for better growth performance and carcass development, at least 30% of concentrate needed to be included per day in their diets. Meanwhile, the incessant increase in the price of concentrate had limited a host of rabbit farmers from utilizing it. Maize which constitute about 70% of the diet of most monogastric animal (Oluyemi and Roberts, 2013) have gone far beyond the reach of farmers thus necessitating a search for a possible cheaper alternative energy ingredients for maize (Kwari *et al.,* 2014). The use of farm wastes and products as an energy source substitute have been widely documented (Adeyemi *et al.,* 2014). Meanwhile, Cassava (Manihot sp) is a widely grown crop in Nigeria with about 59.4million tons yield in (Olutosin and Sawicka, 2019) Cassava tolerate and grow on any land irrespective of their nutrient composition and prevailing weather condition (Ikuemonisan *et al.,* 2020). Nigeria is known to be the largest producer of cassava in the world (FAOSTAT, 2019). The cassava root and leaf nutrient composition have been well documented (Natalie *et al.,* 2016) and can compete favourably with maize if enhanced processing method is applied. The cassava root is the products after the peel have been collected. These root are fed dry, fermented or steamed-up to livestock. However, a major constraint to the incorporation of cassava root and leaf is the presence of the hydrocyanic acid (HCN). This cyanogenic substance have been confirmed to reduce through different treatments methods (Aro, 2008). This research work then utilizes the fermentation of cassava root and leaf blend to replace maize at graded levels in the diet of weaner rabbits and recorded its effect on the gut microflora.

MATERIAL AND METHODS

Experimental Site

The experiment was carried out at the Teaching and Research Farm of Yaba College of Technology, Department of Agriculture, Epe, latitude 6.58^{o}N, Longitude 3.98^{o}E (Google Earth 2021) situated at Km 16 along Epe-Ijebu-ode road, Lagos.

Preparation of test ingredients

Fresh cassava root tubers (TMS30572) and leaves were harvested from the Teaching and Research Farm of Yaba College of Technology, Epe. They were washed and chopped into smaller pieces using

a kitchen knife. The chopped root and leaves were mixed together at a ratio of 3:1 (w/w) and bagged in sac. The content of the bag were then place under press and was allowed to ferment for 5days. The product of the fermentation referred to as Fermented Cassava Root-leaf Blend (FCRLB) was then air dried for 2days and thereafter oven dried at 65^{o}c for 10minutes and bagged for proximate analysis (Table 1). The fermentation helps to reduce the cyanide content of the cassava thus increasing its nutritive value. The fermented cassava root-leaf blend (FCRLB) was then used to formulate weaned rabbit's diets (NRC 2012). Five experimental diets were formulated and pelletized using FCRLB to replace maize at 25, 50, 75 and 100% replacement levels (Table 2).

Experimental Design

A total of forty unsexed weaned New Zealand white rabbits of about 700-800g body weight were procured from a reputable farm at Ikorodu, Lagos State and housed in 20 hutches for 7 days to acclimatize. Routine medication (Deworming and Delousing) were applied on them prior to the commencement of the experiment. They were later allotted on weight equalization basis into five experimental diets where a standard basal diet (maize only) served as control and four other diets with FCRLB replacing maize at 25, 50, 75 and 100% levels. Each treatment had eight rabbits. The treatments had four replicates each and two rabbits forms a replicate. The feeding trials lasted 56days with formulated feed and water offered *ad-libitum* to the rabbits.

Statistical analysis

Data were collected on the gut microflora of the rabbits at the end of the experiment and were analyzed using a one way analysis of variance. The significant means were separated and compared using Duncan Multiple Range Test (Duncan 1995) at 5% level of probability (SAS 1999), Table3.

RESULTS AND DISCUSSION

There were significant differences across all parameters observed and the treatments. *Pseudomonas* counts was present in the caecum of rabbits across the dietary treatments with the highest count on T4 (75% FCRLB replacement for maize), which also had the highest count for *Streptococcus* and *Staphylococcus*. *Escherichia coli* and *Salmonella* were only isolated in T4. *Bacillus* count was highest in the control (Maize only) diet, whereas *Klebsiella oxytocia* was only noticed in T3 and T5. *Proteus* was not counted in T3, T4 and T5 though the highest count was noticed in T1 (control treatment). There was no *Streptococcus* count in T3 and T5. Feed composition could have a considerable effect on the caeca environment as observed with the *Pseudomonas* count that vary as the level of fermented cassava root-leaf blend increases in the diets. Lower counts of *Lactobacillus* with higher counts of *Escherichia coli* and *Salmonella* have been reported to exact a stabilizing effect on gut microbiology and improved nutrient digestibility (Brenes and Roura 2010) and this is in agreement with this study. Increased *Pseudomonas, Streptococci, Salmonella and Escherichia coli* (Aro *et al.,* 2017) have significant effect on improving caecal microflora. Timbermont *et al*. (2011) reported that diet has a great potential on the caecal microbiome in poultry as dietary components that escapes the host's digestion and absorption serves as the substrates for the growth of intestinal bacteria. The diversity of bacterial species in the gut is one of the most important factors for the establishment of a stable ecosystem in the intestinal tract (Aro *et al.,* 2017).

Table 1: Proximate Composition of Fermented Cassava Root-Leaf Blend (FCRLB)

Parameters	Values
Moisture (%)	6.26
Ether extract (%)	7.84
Crude fibre (%)	2.20
Crude Protein (%)	4.54
Total ash (%)	6.23
NFE (%)	69.11
Cyanide (mg/kg)	3.822

Table 2 Showing the Gross Composition of Experimental Diets (g/100gDM).

Ingredients (%)	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5
Maize	40.00	30.00	20.00	10.00	0.00
FCRLB	0.00	10.00	20.00	30.00	40.00
Soybean meal	17.00	17.00	17.00	17.00	17.00
Wheat offal	35.00	35.00	35.00	35.00	35.00
Fish (72%)	1.00	1.00	1.00	1.00	1.00
Bone meal	2.50	2.50	2.50	2.50	2.50
Limestone	1.50	1.50	1.50	1.50	1.50
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Molasses	2.00	2.00	2.00	2.00	2.00
Total	**100**	**100**	**100**	**100**	**100**
Determined analysis					
Crude protein (%)	18.00	17.83	17.76	17.62	17.54
Crude fibre (%)	10.01	10.17	10.28	10.37	10.49
Ether extract (%)	6.84	6.79	6.71	6. 63	6.52
Ash (%)	8.82	8.77	8.88	8.92	9.01
ME (kcal/kg)	2520	2544	2553	2561	25820

Premix: *Vit. A. 5,500,000 (iu), Vit D3. 1500,000 (iu), Vit E. 10,000 (mg), Vit.k3 1,500 (mg), Vit. B1, 1,600 (mg), Vit. B2 24,000 (mg), niacin 20,000mg, pantothenic acid 5,000mg vit B6 1,500mg, Vit. B12 10mg, folic acid 500mg, Biotin H2 750mg, chlorine chloride 175,500 mg, cobalt 200mg, copper 300mg, iodine 1,000mg, iron 20,000mg, manganese 40,000 (mg), selenium 200mg, zinc 30,000mg, anti- oxidant 1,250mg.* FCRLB = fermented cassava root-leaf blend

Table 3: Caeca Microflora of Weaned Rabbits

Parameters (1.8 x 10^4cfu/ml)	T1	T2	T3	T4	T5	SEM
Pseudomonas	1.40^{c}	1.70^{ab}	1.50^{bc}	1.90^{a}	1.50^{bc}	0.006
Streptococcus	1.63^{b}	1.70^{ab}	0.00^{c}	1.90^{a}	0.00^{c}	0.23
Proteus	1.40^{a}	1.27^{b}	0.00^{c}	0.00^{c}	0.00^{c}	0.18
Staphylococcus	0.00^{c}	0.00^{c}	1.50^{b}	1.90^{a}	1.37^{b}	0.21
Klebsiella oxytoca	0.00^{b}	0.00^{b}	1.40^{a}	0.00^{b}	1.50^{a}	0.91
Bacillus	1.80^{a}	0.00^{c}	1.40^{b}	0.00^{c}	0.00^{c}	0.21
Escherichia coli	0.00^{b}	0.00^{b}	0.00^{b}	1.90^{a}	0.00^{b}	0.20
Salmonella	0.00^{b}	0.00^{b}	0.00^{b}	1.80^{a}	0.00^{b}	0.19

^{abcd} means in the same column with different superscripts were significantly ($p < 0.05$) different.

CONCLUSION AND RECOMMENDATION

This research therefore concluded that fermented cassava root-leaf blend mixed at 3:1 ratio can successfully replace maize up to 75% level in the diet of weaned rabbits without any deleterious effects on their caeca microflora. We therefore recommends that fermented cassava root-leaf blend can be used to replace maize in the diets of weaned rabbits up to 75% level.

REFERENCES

Adeyemi, O. A., Adesanya, P. A.. Eniolorunda, O. O., Sogunle, O. M.. Egbeyale, I. T and Njoku, C. P 2014 Performance of growing rabbits fed diets containing fermented and unfermented cassava leaf: peel meal mix as replacement for maize. *Malaysian Journal of Animal Science 17(1) 61-72*

Ajani, J.O., Oyekan, O.O., Udagbe, O.M., Ogundimu, O.A and Oyewole, O.O. 2020. Prolificacy and fecundity studies among selected breeds of rabbits (*Oryctolagus cunniculus*) Linnaeus. *International Journal of Animal Health and Livestock Production Research. 4(1):55-70.*Aro, S.O. 2008. Improvement in the nutritive quality of cassava and its by-products through microbial fermentation. *African Journal of Biotechnology*, 7 (25):14-26

Aro, S.O., Aletor,V.A and Oladunmoye, K. 2017. Feeding microbe-cassava tuber waste modulates gut microbiota and faecal characteristics of growing pigs. *Fermentation Technology 6:145-155. doi:10.4172/2167-7972.100014.*

Brenes, A.A and Roura, E. 2010. Essential oils in Poultry nutrition: Main effects and modes of action. *Animal Feed Science Technology. 158:1-14.*

Duncan, D.B. 1995. Multiple range and multiple F tests. Biometrics. 11:1–42.

FAOSTAT 2019. Food and Agriculture Organization Data. http://www.fao.org/faostat/en/#data (Google Scholar).Google Earth 2021. Earthmaps. Online map finder.com.*http;//Google Lagos/763331220023114*Ikuemonisan, E.S., Mafimisebi, T.E., Ajibefun, I and Adenegan, K. 2020. Cassava Production in Nigeria: trends, instability and Decomposition analysis (1970-2018) Heliyon, Elvisier.Kwari, I.D., Igwebuike, J.U., Taiya, H., Muhaamad, A.A and Raji, A, O. 2014. Haematology and serology of broiler chickens fed maize, sorghum and millet and their combinations in the semi-arid zone of Nigeria. *International Journal of Science and Nature. 5 (2):319-322*Mafimidiwo, A.N., Sobayo, R.A., Muhammad, S.B., Williams, G.A and Adesanya, O.F. 2022 Carcass characteristics of Weaner rabbits fed graded levels of Urea-molasses treated maize cob as a replacement for wheat offal. *Proceedings of the 47th Annual conference of the Nigerian Society for Animal Production (NSAP), Jos, Nigeria.*Natalie, K. Morgan and Mingan Choct. 2016. Cassava: Nutrient composition and nutritive value in Poultry diets. *Animal Nutrition. 2(4):253-261* National Research Council (NRC) 2012 Nutrient Requirements of Swine. 11th Edition, National Academies Press, Washington DC.Olutosin, A. O. and Sawicka, B. 2019. Cassava, a 21st Century Staple Crop: How can Nigeria harness its enormous trade potentials? *Acta Agriculture Slovenica*. 3(8): 194-202

Oluyemi, J.A and Roberts, F.A. 2013. Poultry production in warm wet climates. Spectrum books limited, Ibadan. Pp 153-155.

SAS, (1999) Statistical Analysis System, Statistical Methods. SAS Institute Inc., Cary, NC. 16.

Timbermont, L., Haesebrouck, F., Ducatelle, R and Van Immerseel, F. 2011. Necrotic enteritis. *Applied Environmental Microbiology, 74: 783-791*.