GRAIN REPLACEMENT VALUE OF TIGER NUT (*Cyperus esculentus L.*) MILK RESIDUE MEAL ON PERFORMANCE CHARACTERISTICS AND NUTRIENT DIGESTIBILITY OF GROWING RABBITS

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ABSTRACT
The study was conducted to determine the effect of varying inclusion levels of Tiger nut milk residue meal (TNMRM) on performance characteristics and nutrient utilization of growing rabbits. Thirty crossbred grower rabbits of mixed sexes were used for the experiment which lasted for eight (8) weeks. The animals were randomly distributed after weight balancing into five (5) treatments of six (6) replicate each with a rabbit per replicate in a completely randomized design. Five experimental diets were formulated such that the control diet (T1) had no TNMRM inclusion. TNMRM substituted 5, 10, 15 and 20% of maize respectively in the other treatments. At the 8th week, three rabbits from each treatment were transferred to metabolic cages for digestibility study for three days. All performance characteristics measured were significantly affected ($p<0.05$) except the final weight. The highest feed intake, weight gain, feed cost/KG and feed cost/KG/WG were recorded in T1 while the highest feed:gain ratio was shown in T2. There were no significant differences ($p<0.05$) in the nutrient digestibility except in the crude protein digestibility. The highest crude protein digestibility was shown in T5. It is concluded that tiger nut milk residue meal can be fed up to 20% in the diet for growing rabbits without adverse effect on all the parameters measured.
Keywords: Tiger nut milk residue meal, rabbit, nutrient digestibility, performance characteristics

INTRODUCTION

Feeding in intensive rabbit production has been proposed to be the most important aspect of production, representing 70% of the total cost of production (Olivera *et al*., 2008). Availability of traditional rabbit feed ingredients has been a challenge due to direct competition between humans and livestock (Akinmutimi and Osuagwu, 2008). Asar *et al* (2010) reported that all livestock meat and their products can be made cheaper by utilizing non-conventional feedstuffs which have no direct use as human food. Tiger nut (*Cyperus esculentus* L.) is an under-utilized perennial crop commonly known as earth almonds, chufa and zulu nuts. It is known as Omumu in Yoruba, Aya in Hausa and Akiauasa in Igbo. It has found its usefulness in the production of kunu-a healthy local drink in Nigeria (Belewu and Abodunrin, 2008). Tiger nut is a good source of dietary fibre and the residue can be further processed to livestock feed (Sanchez-Zapata *et al*., 2009; The Spectators, 2010). Tiger nut meal has been incorporated into feeds of pigs, broilers, catfish, cockerel (Bamishaiye and Bamishaiye, 2011; Agbabiaka *et al*., 2013; Ofoefule *et al*., 2013; Maduka and Ire, 2018). This study was designed to investigate the performance and nutrient utilization of rabbits fed diets containing varying level of tiger nut milk residue.

MATERIALS AND METHODS

The study was conducted at the Rabbit Production and Research unit, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. Thirty crossbred grower rabbits of mixed sexes between were used for the experiment. The animals were randomly distributed into five (5) dietary treatments of six replicates each after weight balancing in a completely randomized design experiment. They were housed separately in cages made of galvanized wire mesh with a 14cm×18cm×12cm dimension. They were offered pelletized feed twice daily using concrete feeders and served water in concrete drinkers throughout the experiment which lasted for eight (8) weeks. Fresh tiger nut milk residues were obtained from local Tiger Nut Milk processing outlets within Ogbomoso North Local Government Area and sundried to 10-12% moisture. Five experimental diets were formulated with Treatment one (T1) as the

control diet; Treatment 2,3,4 and 5 had 5%,10%,15% and 20% maize of the control substituted with TNMRM respectively. The proximate composition of TNMRM and experimental diets as shown in Table 1 were analyzed according to the procedures of A.O.A.C (2005). Data collected included performance parameters and digestibility study. The data collected were subjected to One-way analysis of variance using the General Linear Model procedure of SAS (2010) and means were compared using Duncan's Test of the same package.

Table 1: Gross composition of Experimental diets (g/100g)

Ingredients(g/100g)	**Diet 1**	**Diet 2**	**Diet 3**	**Diet 4**	**Diet 5**	**TNMRM**
Maize	38.00	33.00	28.00	23.00	18.00	
Fixed ingredients	62.00	62.00	62.00	62.00	62.00	
TNMRM	-	5.00	10.00	15.00	20.00	
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	
Nutrient Composition						
Dry matter (%)	90.35	90.55	90.65	90.56	90.68	87.65
Crude Protein(%)	16.56	16.74	17.05	16.93	17.16	8.73
Crude Fat (%)	3.57	3.63	3.71	3.61	3.76	21.14
Crude Fibre(%)	5.24	5.45	5.36	5.20	5.15	13,74
Ash (%)	6.80	6.62	6.73	6.57	6.54	1.38
Nitrogen Free Extract(%)	58.18	58.11	57.71	58.25	59.07	42.66
M.E (Kcal/kg)	2680	2665	2685	2671	2691	3120
Feed Cost/Kg (₦)	92.79	87.34	81.89	76.44	70.99	-

Fixed ingredients: soy bean meal 15.00, palm kernel cake 3.00, rice husk 17.10, wheat offal 15.30, corn bran 3.50,corn cobs 4.00, bone meal 3.00, lysine 0.30, methionine 0.25, salt 0.5, premix 0.30 TNMRM= Tiger Nut Milk Residue Meal

RESULTS AND DISCUSSION

Table 2: Grain Replacement Value of Tiger nut milk residue meal on performance characteristics of growing rabbits.

Parameters	T1	T2	T3	T4	T5	SEM	P-Value
Initial Weight(g)	1014.33	1077.33	1017.33	1003.00	1105.00	20.35	0.49
Final Weight(g)	1941.50	1896.67	1884.67	1866.25	1825.00	23.99	0.63
Daily Weight gain(g)	16.56^{a}	14.63^{a}	15.48^{a}	15.42^{a}	12.86^{c}	0.63	0.04
Daily Feed Intake(g)	123.53^{a}	111.78^{ab}	104.26^{b}	102.01^{b}	103.05^{b}	2.17	0.01
Feed to Gain Ratio	7.46^{b}	7.64^{b}	6.74^{c}	6.62^{c}	6.62^{c}	0.41	0.03
Feed Cost/Kg(₦)	92.79^{a}	87.34^{b}	81.89^{c}	76.44^{d}	76.44^{d}	1.16	0.01
Feed Cost/Kg/WG(₦)	748.89^{a}	669.74^{b}	571.71^{c}	561.53^{c}	561.53^{c}	0.41	0.03

^{ab}Means in the same row with different superscripts are significantly different ($p<0.05$)

The mean daily feed intake of the rabbits differed significantly ($p<0.05$). It can be observed that the daily feed intake decreases with increasing inclusion of TNMRM. This is in contrast with the report of Nsa *et al* (2020) which stated that daily feed intake increased as levels of tiger nut meal increased from 0 to 24%. The reduced feed intake can be linked with the high dietary fibre content of TNMRM. It may also be due to the presence of anti-nutritional content (Archibong *et al*., 2018). The low daily weight gain of T5 is directly proportional to the low feed intake of the rabbits in the treatment. The feed cost/Kg decreased across the treatments as the inclusion level of TNMRM increased. This also affected the feed cost/Kg/WG and it is shown that the cost required to gain a kilogramme of body weight is reduced in comparison with

the control. This can be attributed to the high cost of maize in comparison with TNMRM. This contradicts the report of Archibong *et al*., 2018 who fed Tiger nut meal to broiler birds at both starter and finisher phase. It was shown that there was slight increase in the cost per kg of the diets as the level of inclusion of tiger nut meal increased in the diets.

Table 3: Grain Replacement Value of Tiger nut (*Cyperus esculentus* L.) milk residue meal on nutrient digestibility of growing rabbits

Parameters (%)	T1	T2	T3	T4	T5	SEM	P-Value
Dry Matter	73.25	73.84	73.06	72.18	76.86	0.70	0.27
Crude Protein	82.63^{ab}	80.93^{b}	79.79^{b}	81.58^{b}	86.13^{a}	0.74	0.03
Crude Fibre	31.83	25.79	21.54	19.58	37.91	2.60	0.12
Ether Extract	76.74	76.96	76.97	76.15	81.10	0.97	0.56
Ash	13.26	11.57	14.93	16.03	18.95	1.61	0.72
Nitrogen Free Extract	81.06	83.22	82.37	80.22	83.15	0.59	0.45

^{ab} Means in the same row with different superscripts are significantly different ($p<0.05$)

The nutrient utilization showed significant differences ($p<0.05$) in the crude protein digestibility alone. The highest value of crude protein digestibility was obtained in the diet with the highest inclusion (T5, 20% inclusion) and this negates the report of Nsa *et al*., 2020 who showed that inclusion level above 16% of Tiger Nut milk residue in the diet depressed the digestibility of crude protein and the inhibition of protein metabolism was attributed to the implication of Trypsin inhibitor and hemagglutinin.

CONCLUSION

It can therefore be concluded that the grain replacement value of TNMRM in rabbit's diets has no significant effect on the final weights of the rabbits and inclusion of TNMRM in rabbit's diets up to 20% will reduce the feed cost/kg weight gain of the rabbits.

RECOMMENDATION

It is therefore recommended that TNMRM can be included at 20% in the diet of rabbits without any negative effects on the final weights.

REFERENCES

Agbabiaka L.A., Madubuiko C.U. and Anyanwu C.N. (2013). Replacement value of tiger nut meal (*Cyperus esculentus*) with maize in catfish (*Clarias gariepinus*) diets. *Science Research Reporter*, 2(2):130-134.

Akinmutimi A.K. and Osuagwu C.C. (2008). Response of weaner rabbits fed graded levels of sweet potato meal in place of maize-based diet. *Pakistan Journal of Nutrition*, 7(5):705-709

Archibong E.E., Nsa E.E. and Umoren U.E. (2018). Nutritional evaluation of (*Cyperus esculentus*) meal as a replacement for maize in broiler diets. *Nigerian Journal of Animal Production*, 45:90-98

AOAC (2005). Official Methods Analysis 15th Edition Association of Official Analytical Chemists, Washington D.C

Asar M.A., Mona O., Yakout H.M. and Safoat A. (2010). Utilization of corn-cob meal and faba straw in growing rabbits' diets and their effects on performance, digestibility and economic efficiency. *Egyptian Poultry Science Journal*, 30:415-442

Bamishaiye E.I.M. and Bamishaiye O.M. (2011). Tiger nut: As a plant, its derivatives and benefits. *African Journal of Food, Agriculture, Nutrition and Development*, 11(5):5157-5170

Belewu M.A. and Abodunrin O.A. (2008). Preparation of kunufrom unexploited rich food source: Tiger nut (*Cyperus esculentus*). *World Journal of Dairy and Food Science*s, 1:19-21

Maduka N. and Ire F.S. (2018). Studies on tiger nut-ogi incorporated into basal feed as a potential growth enhancer using wistar albino rats as experimental animal. *International Journal ofAdvanced Microbiology*, 8(2):1-15

Nsa E.E., Pascal O.O. and Archibong E.E. (2020). Feeding value of Tiger nut (*Cyperus esculentus)* meal for growing rabbits. *Sumerianz Journal of Agriculture and Veterinary*, 9:27-34

Ofoefule A.U., Ibeto C.N., Okoro U.C. and Onukwuli O.D. (2013). Biodiesel production from tiger nut(*Cyperus esculentus)* oil and characterization of its blend with petrol diesel. *Physical Review and Research International*, 3(2): 145-153

Olivera A.F.G., Scapinello C., Maria B.G., Jobim C.C., Monteiro A.C., Furuta L., and Ferreira W.M. (2008). Use of simplify diet with cassava by-products for rabbits. Proceedings of the 9th World Rabbit Congress, 10-13 June 2008, Verona, Italy, Pp 775-779

Sanchezs-Zapata E., Fuetes-Zaragoza E., Fernandez Lofez J. Sendra, SayasBarbera E., Navarro C. and Prez-Alvarez J.A (2009). Preparation of diet fire powder from tiger nut (*Cyperus esculentus)* milk (Horchata) by-product and its physiochemical properties. *Journal of Agriculture and Food Chemistry*, 57:7719-7725

SAS (2010). Statistical Analysis System Users Guide, SAS Institute, Incorporated.

The Spectators (2010). Importance of tiger nuts @www.peacefmonline.com