EFFECTIVE RABBIT PRODUCTION USING TIGER NUT (*Cyperus esculentus*) WASTE AS A fibre SOURCE

***Mafimidiwo, A. N., Oyedele, O. O., Uduak, L. E., Shotayo, A. L., Adeboye, K. S. and Ige, D. S.**
Department of Animal Production Technology, Yaba College of Technology, Yaba – Lagos
*Corresponding author: ayotunde.mafimidiwo@yabatech.edu.ng; +2348023024349.

ABSTRACT
Fiber as a major constituent of livestock feed had become a constraint today as the cost price kept soaring thereby making it impeccable for farmers to sustain their production. Wheat offal is a generally acceptable fibre source for all categories of livestock but it is now cost in-effective, thus necessitating a quest for an alternative. This six-week research employed the substitution of tiger nut waste (TNW) for wheat offal in rabbit diets at 0, 15, 30, 45 and 60% levels. Thirty unsexed New Zealand x California rabbits about 7 weeks old, average weight 950g were randomly allotted into five dietary treatments. Each treatment had six rabbits replicated thrice with two rabbits. Feed and clean water were offered liberally throughout the experimental period. The feed intake, weight change of the rabbits was measured weekly and were used to determine the feed conversion ratio (FCR). The result reveal that the growth performance parameters measured were not affected by the level of tiger nut waste substitution for wheat offal although different values were observed in each of the parameter. No mortality was recorded throughout the experimental period. However, the best FCR was observed in rabbits fed 30% TNW substitution for wheat offal. The highest weight gain was recorded in rabbits fed 45% TNW substituted diets which also is reflective in the feed intake. The experiment concluded that for better weight gain and feed conversion ratio, rabbit diet can be substituted with 30% TNW for wheat offal and it is hereby recommended.
Keywords: Rabbit, New Zealand White, Diets, Waste, Mortality.

INTRODUCTION

Agricultural waste is generated in large quantity in Nigeria but are seldom under-utilized (Abdullahi *et al*., 2022). These agricultural wastes can however be converted to wealth if properly applied (Mafimidiwo and Williams, 2024). Tiger nut (*Cyperus esculentus*) is known as Aya amongst the Hausa speaking tribe of Northern Nigeria, Ofio in Yoruba and Akiausa in Igbo language (Umerie *et al*., 1997). Tiger nut is a perennial nut grown mainly in Northern Nigeria (Nata'ala *et al*., 2018). Tiger nut is rich in fibre, unsaturated fat and moderate quantity of protein (Roselle, 2020). It can be eaten raw, baked, roasted, dried or processed into spiced drinks with ginger, black pepper and rosemary (Kayode *et al*., 2017). Its carbohydrate content is not usually fully extracted during the making of tiger nut milk which is its most popular product thereby retaining a large chunk of the carbohydrate in its waste (Ohanusi *et al*., 2024). Tiger nut waste (TNW) is rich in glutamic acid, low in tryptophan, had crude protein 10.15%, Ether extract 4.035%, crude fibre 23%, NFE 54.75% and ash 2.68% (Ohanusi *et al*., 2024). Tiger nut waste's high fibre made it to be incorporated in the treatment of gastro-intestinal disorders, obesity as well as colon cancer (Mason, 2005). Its high content of iron and calcium is applied in the treatment of coronary heart related diseases (Oladele and Aina, 2007). Tiger nut waste can be fed to livestock and for making bioethanol (Nata'ala *et al*., 2018) and bio-power to be used as fuel for SI engines (Ohanusi *et al.,* 2024). The fibre in TNW can serve as sources of fermentable sugar (Falowo *et al*., 2023). Rabbit meat is very popular in Spain, Italy and France (Trocino *et al.,* 2019) and can be suitable to succour the meat deficiency in the tropics. Rabbits as a pseudo-ruminant has capacity to tolerate feed with high crude fibre content (Mafimidiwo *et al*., 2022). It can easily digest the fibre with the aid of the microbes in its caecum to yield quality edible meat (Mafimidiwo, 2023). The cost of wheat offal which is the conventional fibre source have skyrocketed thus increasing the cost of livestock feed. Therefore, this research work exploits the possibility of incorporating tiger nut waste as fibre source in rabbit diets.

MATERIALS AND METHODS

Experimental site, Experimental diet preparation and Animal allotment

Thirty grower (New Zealand x California) breed of rabbits weighing about 930-980g were procured from Institute of Agricultural Research and Training Ibadan and conveyed into the Teaching and Research Farm of the School of Agricultural Technology, Yaba College of Technology, Epe Lagos lying on latitude 6.58°N, longitude 3.98°S (Google Earth, 2024) for the experiment. Prior to their arrival, fifteen hutches were cleaned and disinfected. Each hutch was supplied with a feeding and drinking trough each. The rabbits were distributed on weight equalization basis into five dietary treatments after observing two weeks of stabilization in the new environment. Five experimental diets containing tiger nut waste at 0, 15, 30, 45 and 60% replacement for wheat offal (NRC, 2012) Table 1. Six rabbits were allotted per treatment with two rabbits per replicate and each treatment having three replicates. The feeding trial lasted for six weeks.

Data Collection

Data were collected on a weekly basis on feed intake, weight change, feed conversion ratio and mortality (Table 2). The data collected were subjected to analysis of variance on a probability of 5% (SAS, 2002). The significant means were separated using Duncan multiple range test 1995.

RESULTS

The results obtained reveal a no significant difference ($p<0.05$) across all the parameter measured even though that there were differences in the values observed. Highest weight gain was observed in rabbits fed T4 (45% TNW) while the least value was on T5 (60% TNW) and this was equally reflective in the final weight recorded. Highest feed intake was observed in rabbits fed 45% TNW (T4) while the best feed conversion ratio was recorded in rabbits fed 30% TNW (T3). Daily weight gain was highest in rabbits fed 15% TNW (T2).

Table 1: Showing Ingredients and Nutrient composition of experimental diets

Material	T1 0%	T2 15%	T3 30%	T4 45%	T5 60%
Maize	30	30	30	30	30
Soybean meal	14	14	14	14	14
Blood meal	1.0	1.0	1.0	1.0	1.0
Palm kernel cake	10	10	10	10	10
Wheat offal	38	32.3	26.6	20.9	15.2
Tiger nut waste	-	5.7	11.4	17.1	22.8
Molasses	2.5	2.5	2.5	2.5	2.5
Bone meal	2.0	2.0	2.0	2.0	2.0
Limestone	2.0	2.0	2.0	2.0	2.0
Salt (Nacl)	0.35	0.35	0.35	0.35	0.35
Premix	0.05	0.05	0.05	0.05	0.05
Lysine	0.05	0.05	0.05	0.05	0.05
Methionine	0.05	0.05	0.05	0.05	0.05
Total	100	100	100	100	100
Calculated Analysis (%)					
Crude protein	18.34	18.20	18.04	17.60	17.46
Crude fibre	7.25	7.52	7.58	8.17	8.43
Ether Extract	2.82	3.28	3.72	4.24	4.69
Ash	3.41	3.83	3.61	3.38	3.16

Table 2: Growth performance of rabbits fed diets with Tiger nut waste as fibre source.

Parameters (g)	T1	T2	T3	T4	T5	SEM	P-value
Initial weight	980	960	960	960	930	0.05	0.96
Weight gain	830	910	890	930	690	0.08	0.91
Daily weight gain	19.76	21.67	21.19	22.14	16.43	0.08	0.91
Final weight	1800	1880	1850	1890	1610	0.07	0.74
Total feed intake	690	740	690	810	610	0.08	0.97
Daily feed intake	16.43	17.62	16.43	19.29	14.52	0.08	0.97
Feed conversion ratio (%)	0.83	0.81	0.76	0.87	0.88	0.21	0.99
Mortality (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DISCUSSION

The nutrient composition of the tiger nut waste used in this experiment slightly differ from those reported by Ohanusi *et al*., (2024) and the difference could be attributed to the extraction system employed. Although there was no significant difference in all the parameters appraised in the performance table, yet the daily weight gain reported in this research was not in agreement with those reported by Bajeh *et al*., (2022) who reported that the weight gain of rabbits was influenced when he used burukutu waste (A waste product of alcohol fermentation) as fibre source in growing rabbit's diet even though that the feed intake then was not affected. The range of daily weight gain (14.54-19.29g) recorded in this research is higher than the 5.68-7.65g reported by Mafimidiwo *et al.,* (2022) when maize cob was used to replace wheat offal in growing rabbit diets. The daily feed intake (14.52-19.29g) of rabbits in this work was far lower than (36.87-42.40g) those reported by Mafimidiwo *et al*., (2022) This could connote that higher fibre could lower the feed intake of rabbits even though that this does not have any

detrimental effect on the rabbits here. Again, Olumide *et al*., (2020) reported that feed intake, Final weight and the feed conversion ratio were significantly influenced by the dietary fibre composition when he utilized 5% TNW in the diet of finisher broiler chicken whereas that was not experienced in this experiment. However, Rabie *et al.,* (2011) had earlier reported that increasing dietary fibre of postweaning rabbits from 12.5%-16.5% does not have any influence on the efficiency of energy utilization (EEU), daily feed intake and FCR which is similar to what was observed in this research. Feed conversion ratio was at best in this work with 30% TNW substitution for wheat offal, which was not in tandem with the report of Rabie *et al*., (2011) who reported improved FCR as the fibre in post-weaned rabbit's diets increases from 12.5 -16.5% using tiger nut waste as the fibre source but the FCR decline with higher incorporation of TNW above 30% in this research. This experiment therefore concluded that rabbit can tolerate up to 30% tiger nut waste in replacement for wheat offal without compromising the growth performance and better feed conversion ratio and it is hereby recommended.

REFERENCES

Abdullahi, N., Badau, M., Umar, N.B., Illiyasu, R., Hassana, J., Adamu, U and Alkasim, K (2022). Tiger nut: A nutrient-rich underutilized crop with many potentials. *Federal University Du-Simma Journal of Science*, 6 (2):103-115. Doi: https://doi.org.10.33003/fjs-2022-0602-928.

Bajeh, A.Y., Onipe, S.H and Adejumobi, P.O (2022). Utilization of Agro-industrial wastes on the growth performance, carcass characteristics and blood profiles of growing rabbits. *International Journal of latest Technology in Engineering, Management and Applied Science,* 11 (7):5-8.

Duncan D. B. (1955). Multiple Range and Multiple tests. Biometrics 11:1-42.

Falowo, O., Taiwo, A., Latinwo, L and Betiku, E (2023). Current status of substrate hydrolysis to fermentable sugar. Doi: https://10.1007/978-3-031-36542-3_4.

Google earth (2024). https:// www.google.com.

Kayode, R.M., Joseph, J.K., Adegunwa, M.O., Dauda, A.O., Akeem, S.A., Kayode, B.I., Babayeju, A.A and Olabanji, S.O (2017). Effect of additional different species of the quality attributes of tiger nut milk (Kunum-aya) during storage. *Journal of Microbiology, Biochemistry and Food science*, 7(1):1-6.

Mafimidiwo, A.N., G.A. Williams., Z.T. Mafimidiwo., C.P. Njoku and R.A. Sobayo. (2022). Growth Performance, nutrient digestibility and carcass characteristics of growing rabbits fed varying levels of urea-molasses treated maize cob as a replacement for wheat offal. *Nigerian Journal of Animal Production.* 49 (3): 138-148.

Mafimidiwo, A.N. (2023). Gut Morphology and Sensory Evaluation of Growing Rabbits fed Urea-molasses treated maize cob as substitute to wheat offal. *Proceedings of the 48th Annual Conference of the Nigerian Society for Animal Production (NSAP) held on 19th – 22nd June 2023 at Federal University Dutsin-ma, Katsina State*. Pp. 1187-1190.

Mafimidiwo, A.N and Williams, G.A. (2024). Dietary replacement of maggot meal for soybean meal: implication on performance indices, nutrient digestibility, nitrogen utilization and carcass characteristics of grower rabbits. *Tropical Animal Health and Production*, 56:115-127. https://doi.org/10.1007/s11250-024-03965-5.

Mason, D. (2005). Tiger nuts. In http://.www.nvsuk.org.uk/growing_showvegetable 1/tiger nut.php.

Nata'ala, M.K., Farouq, A.A., Magashi, A.M and Liman, M.G (2018). Assessment of the potentials of production of bioethanol using *Cyperus esculentus* L (Tiger nut) residue by simultaneous saccharification and fermentation. *Asian Journal of Biotechnology and Bioresources Technology*, 3 (3):1-10.

NRC. (2012). National Research Council. Nutrient Requirement of Swine. 11th Edition, National Academics Press, Washington DC.

Ohanusi, I., Braide, W., Akujobi,C.O and Adieze, I.E (2024). Proximate composition and amino acid profile of Tiger nut Waste for Bioethanol production. *International Journal of Advanced Research in Biological Science,* 11(2):61-66. Doi: https://dx.dx.doi.org/10.22192/ijarbs.2024.11.02.007.

Oladele, A.K and Aina, J.O (2007). Chemical composition and functional properties of flour produced from two varieties of Tiger nut (*Cyperus esculentus). African Journal of Biotechnology*, 6 (21):2473-2476.

Olumide, M.D., Tayo, O.G., Oyesanwen, O.A and Ajayi, O.A (2020). Evaluation of Tiger nut *(Cyperus esculentus*) waste as feed ingredient in broiler chicken diet. *Nigerian Journal of Animal Science*, 22 (3):209-215. Doi: https://www.ajol.info/index.php/tjas.

Rabie, M.H., Sherif, K.E., Hussein, M.A.A. and El-Desouqi, A.R.F (2011). Growth performance of rabbits as affected by dietary fibre level and probiotic addition during the postweaning period. *Journal of Animal and Poultry Production, Mansoura University,* 2 (6):185-199.

SAS (2002). Statistical Analysis System Institute Version 8, SAS Institute, Cary 112.

Umerie, S.C., Okafor, E.P and Uka, A.S (1997). Evaluation of the tubers and oil of *Cyperus esculentus*. *Bioresources Technology*, 61:171-17.