IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 14, Issue 4 Ser. I (April 2021), PP 44-48
www.iosrjournals.org

Evaluation of Yam peels meal as replacement of maize on the growth performance, carcass characteristics and cost benefits of growing rabbits.

Amaza[1], I. B.; Maidala[2], A.; Moseri[3], H.
1 & 2 Department of Animal Science. Federal University Gashua, Yobe State, Nigeria.
3 Department of Agricultural Education. College of Education Agbor, Delta State, Nigeria.

Abstract
A Feeding trial was conducted for eight weeks to evaluate the effect of replacing Maize with graded levels of Yam Peel Meal (YPM) in the diet of growing Rabbits on growth performance, apparent nutrient digestibility, carcass characteristics and cost benefit. A total of 36 rabbits of mixed breeds (New Zealand and Chinchilla) were procured and used for the study. The rabbits were individually weighed and randomly assigned to four dietary treatment groups with 12 rabbits and replicated three times with three rabbits per replicate in a completely Randomized Design. Rabbits in dietary treatment T_1 (0%YPM) served as control while those in T_2, T_3 and T_4 had 12.5, 25.0 and 37.5 % YPM as a replacement of maize. The data obtained were analyzed using one way analysis of variance (ANOVA). Results showed that growth performance indices, nutrient digestibility, dressed weight, dressing percentage and relative cost benefit were better in Rabbits fed YPM based diets. However, best results were recorded in T_4 (37.5% YPM) with daily weight gain (46.4g), feed conversion ratio (4.4), *NFE digestibility (46.4%), dressing percentage 60.7%) and relative cost benefit (26.7). It can be concluded that dietary of replacement of Maize with YPM up to 37.5% has no adverse effects on performance and higher relative cost benefits is achieved.*
Key words: *Energy, feed, ingredients, unconventional,*

Date of Submission: 14-04-2021 Date of Acceptance: 28-04-2021

I. Introduction

The livestock sector in Nigeria faces some daunting challenges, notable amongst these are inadequate supply and exorbitant prices of feed ingredients particularly maize which serves as main energy source in compounding ration for non-ruminants. USDA (**2015**) reported 71 % increased in price of maize between September 2005 to September 2015 in Africa, precisely Nigeria, which has led to rising of hunger and starvation in sub regions of Africa. The first and most important indicator is protein-energy malnutrition WHES (2015). The average per capita protein daily intake in Nigeria is below the minimum stipulated by FAO (2019). The low level of production of proteins of animal origin is strongly linked to feeding cost which represents a very important portion of animal production Foku et al. (2019).

Response to the challenges posed by rising cost of feed ingredients and the declining availability of animal protein source food will require a paradigm shift. Attempts have been made to utilize locally available and cheap unconventional feed resources to reduce the feed cost and benefit the end users Swain et al. (2014). Another means of solving these problems is by focusing on production of animals with high rate of production and growth Akinmutimi and Onen (2008).

Rabbit is a good potential source for a solution to fulfill the human demand of animal protein in view of the need to save feed grains and to fight against hunger Nguyen Van Thu (2015). Rabbit are placed after chicken for meat, which can be a great source of food production with advantages of very fast growing, better feed converting rate, high productivity, small keeping space, less cost of production, tasty and nutritious meat (Nguyen Van Thu, 2019**)**.Yam peel contains 12.7 % CP, 6.30 % CF and gross energy/kcal/g of 2.98 (Akinmutimi and Onen, 2008).Yam peel is cheap, readily available and has limited use in human diets or industrial uses. Thus, the study evaluated the effect of graded levels of Yam Peel Meal (YPM) as replacement of maize in growing Rabbits.

II. Materials and Methods

Experimental site

The study was carried out at Rabbit Unit, Teaching and Research Farm of Federal University Gashua, Nigeria located at 12^0 52'5" N and 11^0 2' 47"E in the semi-arid region of North Eastern Nigeria with average

elevation of 299 meters above the sea level. The annual rainfall range of 500 to 1000 mm, Summer minimum temperature range from 23 to 28^0C from June to September with a maximum temperature range of 38 ^{0}C to 40^0C between March to April.

Sources and preparation of ingredient

The Yam peel meal (YPM) was procured from Restaurants, eateries in Gashua town, while all extraneous materials were removed through hand picking. The yam peel were sun dried by spreading on a tarpaulin and turned twice daily period and the drying process lasted for 8 days. Then, the experimental ingredients were grinded, bagged and stored for use.

Experimental animal, diets, design and management

A total of 36 growing rabbits of mixed breed (New Zealand and Chinchilla) with average initial weight of 696g were randomly distributed into four experimental diets with three replicate each in a Completely Randomized Experimental Design (CRD). Diet one (T_1) served as control (0 % YPM) while diets T_2, T_3 and T_4 contained 12.5, 25.0 and 37.5 % YPM respectively (Table 1).The rabbits were housed individually in a hutches measuring 60 x 43 x 43 cm and were raised 100 cm above the ground level according to Aduku and Olukosi (1990). Feed and water was provided *ad-libitum*

Data collection

Initial weights of the rabbits were taken at the beginning of the experiment and subsequently on weekly basis before morning feeding with a sensitive digital scale. Total body weight gain(g) was obtained by subtracting the initial weight (g) from the final weight (g), average weight gain(g) was calculated by dividing the total weight gain(g) by the number of rabbits while the daily weight gain(g) was obtained by dividing the total weight gain(g) by the Period of the experiment (in days).

Total feed intake was calculated by subtracting the total quantity of left over feed from the total quantity of feed given over the period of time, while the Feed conversion ratio was calculated as quantity of feed consumed divided by body weight gain. The daily feed intake was determined by dividing the total feed Consumed by the Number of Days the experiment lasted. The average Feed Intake was determined by dividing the total feed Consumed by the number of animals.

At the end of the feeding trial, one rabbit per replicate were randomly selected from each of the pen and housed in separate metabolic cages to measure apparent nutrient digestibility. The Rabbits were allowed three days acclimatization prior to the commencement of the trial. Feed offered and refusal was recorded for seven days. Faecal samples were collected daily and dried in an oven at 60^0C, preserved in bags. At the end, all the daily faecal samples collected from each treatment were pooled together for the determination of proximate composition using the A.O. A.C. (1990).The total tract nutrients digestibility was calculated by the following formula. Nutrient digestibility= Nutrient in consumed feed – Nutrient concentration in faeces divided by Nutrient concentration in feed.

Nine rabbits were randomly selected; one from each replicate fasted for 12 hours before recording their weight, to avoid gut content in the animal's weight as described by Al-Dobaib (2009) and was properly bled after slaughtering. Carcass was dissected and the internal organs evacuated. The parts and organs were expressed as percentage of the live weight.

The economic benefits were determined by the formula described by Balogun et al. (2016) as follows; Cost of feed/kg weight gain=cost of feed/kg (N) – Average feed consumed in kilogramme

Cost of feed intake (N/kg) = Feed cost x total feed intake

Cost of weight gain (N/Kg) = total feed cost (N) divided by weight gain in Kg per rabbits

Cost Benefit Ratio= Total cost divided by the benefits (gain)

Statistical analysis

All data obtained from the study were subjected to one way analysis of variance statistical analysis Software SAS (2004), version nine while differences in means were separated using Duncan's Multiple Range test (1955).

Table 1: Composition of the experimental diets.

INGREDIENTS	T1(0 % YPM)	T2(12.5 % YPM)	T3 (25% YPM)	T4 (37.5%YPM)
Maize	38.00	33.50	28.50	23.75
Wheat offal	8.11	8.11	8.11	8.11
Soybean (full fat)	25.59	25.59	25.59	25.59
Yam peel meal	0.00	4.50	9.50	14.25
Rice offal	21.50	21.50	21.50	21.50
Fish meal	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00

Premix	0.25	0.25	0.25	0.25
Methionine	0.20	0.20	0.20	0.20
Lysine	0.10	0.10	0.10	0.10
Salt	0.25	0.25	0.25	0.25
Cal. Analysis				
Crude protein	16.81	16.76	16.71	16.61
Crude fibre	10.52	11.40	12.37	13.23
ME/Kcal/kg	2507	2400	2280	2053
Calcium	1.39	1.39	1.39	1.39
Phosphorus	0.76	0.75	0.74	0.73

III. Results and discussion

The proximate composition of the experimental diets (Yam peel) as presented in Table 1, dry matter (DM) 95.9 %; moisture 4.14 %; crude protein (CP) 7.78 %; ether extract (EE) 0.80 %; crude fibre (CF) 5.29 %; ash 7.19 %; nitrogen free extract (NFE) 78.9 % and ME/Kcal 1025 obtained were lower than the values reported by Uchewa et al. (2014); Haruna et al. 2018 and Jiwuba et al. (2018). However, the ash content of 7.19 % was lower than 9.80 % reported by Uchewa et al. (2014). The variations may be attributed to Varieties, depth of peeling and processing of yam Ezieshi, et al. (2011).

Table 2: Proximate composition of Yam peel

Crude protein	7.78
Ether extract	0.80
Dry matter	95.9
Crude fiber	5.29
Ash	7.19
ME/Kcal/kg	1045

Triplicate samples were analyzed

Growth performance parameters of growing rabbits fed graded levels of YPM 0, 12.5, 25, and 37.5 %) as replacement of maize are presented in Table 2, Average final body weight 1679 g, 1747 g, 1822 g and 1698g for treatments T_1, T_2, T_3 and T_4 differed ($p<0.05$) amongst groups. This finding is in tandem with Oyewole et al. (2013) who reported ($p<0.05$) effect on final weight gain, total weight gain and daily weight gain of rabbits fed graded levels of YPM. The increase in final and daily weights gain in this study may be attributed to increased feed intake and nutrient utilization. The daily feed intake range values of 69.8 to 83.4% recorded in this study was in line with the values of 68.3 to 97.3% reported by Haruna et al. (2018). Feed conversion ratio were significantly ($p<0.05$) influenced by inclusion of graded levels of YPM in the diets. This differs with Uchewa et al. (2014) who reported no significant difference in feed conversion ratio of rabbits fed graded levels of Yam peel.

Table 3: Growth Performance of growing Rabbits fed graded levels of Yam peel meal

Parameters	**T_1 (0%YPM)**	**T_2(12.5%YPM)**	**T_3 (25%YPM)**	**T_4(37.5%YPM)**	**SEM**
Initial body weight(g)	696^a	694^a	695^a	696^a	6.07
Final body weight(g)	1679.97^c	1747.31^b	1822.28^a	1698.00^d	33.54
Total weight gain (g)	983^c	1053^b	1127^a	1002^d	50.72
Daily weight gain(g)	15.6^c	16.7^b	17.9^a	15.9^c	1.06
Total feed intake(g)	5253^a	5188^b	5109^c	4400^d	38.56
Daily feed intake(g)	83.4^a	82.4^b	81.1^c	69.8^d	3.47
FCR	5.33^a	4.92^b	4.53^c	4.39^d	0.28
Mortality	0.00	0.00	0.00	0.00	0.00

Means within the same row with different superscript letters are significantly different ($p < 0.05$) SEM: Standard error of mean, FCR=Feed conversion ratio,

In Table 4, the apparent crude protein digestibility of diets T_1, T_2 and T_3 (67.7, 70.4 and 73.4%) did not differ significantly ($p>0.05$). However, values differed significantly ($p<0.05$) from value recorded for rabbits fed on diet 4. Ether extract digestibility values range from 69.4 to 88.8% recorded in the study were comparable to the range values of 78.5 to 87.1% reported by Ribikauskiene et al. (2015) for growing rabbits fed different ration types. Ether extract digestibility values of 75.5 and 73.9% recorded for T_1 and T_2 were similar but, differed significantly ($p>0.05$) from T_3 and T_4. The NFE digestibility values were similar for rabbits fed diets T_1, T_2 and T_4 but, differed from the value of 34.1 % recorded for T_3. The diet containing 37.5% YPM had the least digestibility values for all the nutrients except nitrogen free extract.

Table 4: Apparent nutrient digestibility of growing Rabbits fed graded levels of Yam peel meal

Parameters	T_1(0%YPM)	T_2(12.5%YPM)	T_3(25%YPM)	T_4(37.5%YPM)	SEM	
Crude protein	67.7^{a}	70.4^{a}	73.4^{a}	63.3^{b}	1.22	0.005
Ether extract	75.5^{b}	73.9^{b}	88.8^{a}	69.4^{c}	2.25	0.0001
Dry matter	69.0^{a}	72.2^{a}	75.0^{a}	65.9^{a}	1.63	0.213
Crude fibre	71.6^{ab}	75.2^{ab}	78.5^{a}	67.4^{b}	1.77	0.135
ME/Kcal/kg	67.2^{a}	70.4^{a}	70.4^{a}	65.4^{a}	0.96	0.187
NFE	42.7^{a}	42.3^{a}	34.1^{b}	46.4^{a}	1.44	0.002

Means within the same row with different superscript letters are significantly different ($p < 0.05$)

The carcass and organ weights of rabbits fed graded levels of Yam peel as in Table 4, blood loss, dressing percentage, head, kidney, spleen and forelimbs were not significantly ($p>0.05$) influenced by the treatments except dressed weight. The dressing percentage recorded in this study was higher than value of 51.7 to 56. 3% reported by Akinmutimi and Anakebe (2008) but, comparable to range values of 60 to 66.8% reported by Ojabiyi et al. (2013). Range value of 5.4 to 6.2 % for liver expressed as percentage live weight recorded in this study is higher than the range value 2.96 to 3.76% reported by Rajendran et al. (2019), who had earlier reported the effects of anti nutrients were first reflected in the liver and heart. Values of 0.32 to 0.38 % and 0.46 to 0.59 recorded for heart and kidney were similar to values of 0.37 % and 0.64% reported by Rajendran et al. (2019),

The economic values of YPM presented in Table 5. Feed Cost per kilogram in T_2, T_3 and T_4 were lower than that of the control group (T_1). This corroborates report of Uchewa et al. (2014), who reported decrease in cost of production with increasing levels of YPM in the diets of rabbits. Feed cost per rabbit decreased with increasing levels of maize with YPM, this may be related to the rise in cost per kilogram of maize which was about three times more expensive than YPM during the period of study.

Table 5: Cost benefit analysis of growing rabbits fed graded levels of Yam peel meal

Parameters	T_1(0%YPM)	T_2(12.5%YPM)	T_3(25%YPM)	T_4(37.5%YPM)
Feed Cost/kg(N)	103	97	94	91
Average feed consumed (kg)	5.25	5.18	5.10	4.40
Cost of feed consumed (N)	539	504	481	402
Average weight gain(kg)	0.98	1.05	1.13	1.00
Cost of feed/kg weight gain	550	481	426	402
Cost differentials		69.2	124	148
Relative cost benefit (%)		12.6	22.5	26.9

Carcass characteristics such as live weight, slaughter weight and dressed weight differed ($p<0.05$) among the groups except dressing percent. Values of heart, lung, liver, pelt, hind limbs and gastro intestinal tract (GIT) expressed as percentage of live weight differed ($p<0.05$) among groups. The head, kidney, spleen and fore limb did not differ ($p>0.05$) among groups which were tandem with the works of Uchewa et al. (2014) and Rajendran et al. (2019)

Table 6: Carcass and organ weight of growing Rabbits fed graded levels of Yam peel meal

Parameters	T_1(0%YPM)	T_2(12.5%YPM)	T_3(25%YPM)	T_4(37.5%YPM)	SEM
Live weight	1830^{b}	1879^{a}	1904^{a}	1786^{c}	13.9
Slaughter weight	1782^{b}	1827^{a}	1845^{a}	1744^{c}	12.7
Blood loss	51.0^{a}	47.0^{a}	50.0^{a}	51.7^{a}	1.66
Dressed weight	1098^{c}	1139^{ab}	1153^{a}	1084^{c}	8.07
Dressing percentage	60.0^{a}	60.5^{a}	60.4^{a}	60.7^{a}	0.16
Organ parts as percentage of live weight					
Head	8.13^{a}	7.87^{a}	8.01^{a}	8.15^{a}	0.14
Heart	0.34^{b}	0.32^{c}	0.38^{a}	0.34^{b}	0.01
Lungs	0.66^{b}	0.64^{b}	0.73^{a}	0.63^{b}	0.01
Kidney	0.46^{a}	0.59^{a}	0.58^{a}	0.46^{a}	0.02
Liver	5.66^{b}	5.71^{b}	6.23^{bc}	5.41^{c}	0.13
Spleen	0.02^{a}	0.02^{a}	0.03^{a}	0.03^{a}	0.01
Pelt	8.58^{b}	8.34^{c}	8.60^{b}	8.77^{a}	0.02
GIT (Full)	10.9^{a}	10.8^{a}	11.0^{a}	10.5^{b}	0.13
Hind limbs	2.59^{a}	2.57^{a}	2.61^{a}	2.47^{b}	0.01
Fore limbs	1.77^{a}	2.41^{a}	2.45^{a}	2.31^{a}	0.15

Means within the same row with different superscript letters are significantly different ($p< 0.05$). SEM= Standard error of mean

IV. Conclusion

1. It is concluded that rabbits fed YPM based diets compare favorably with the control group and at a least cost.
2. Among the dietary treatment groups investigated 37.5 % inclusion level had superior performance in terms of relative cost benefit, Cost of feed/kg weight gain, feed conversion ratio and without negative effects.
3. It is therefore recommended that up to 37.5% YPM can successfully replace maize in rabbit diet.

References

[1]. **USDA, 2015.** World agricultural supply and demand estimates Retrieved from http://www.usda.gov/oce/commodity/wasde/latest.pdf [accessed 22.07.2020].

[2]. **World Hunger Education Service (WHES) 2015.** World Hunger and Poverty Facts andStatistics.http://www.worldhunger.org/articles/Learn/world%20hunger%20facts%202002.ht

[3]. **FAO, 2019.** The state of food security and nutrition in theWorldhttp://www.fao.org/state-of-food security-nutrition/en/

[4]. **Foku, V. K, Defang, H. F., Kana S. D. A., Amandine, M., Fonteh , F. A. A., Mube, K. H., Ndukum, J. A. 2019.** Effects of graded levels of boiled wild sunflower (**Tithonia** diversifolia Hemsl A. Gray) leaf meal on growth and carcass characteristics of rabbits. Journal of Animal &Plant Sciences. 41(2):6940-6950. https://doi.org/10.35759/JAnmPlSci.v41-2.7

[5]. **Swain, B. K., Naik, P. K., and Singh, N. P. 2014.** Unconventional feed resources for efficient poultry production. Technical Bulletin No. 47, ICAR-ICAR Research Complex for Goa, Old Goa 403 402, Goa, India.

[6]. **Akinmutimi, A. H. and Onen, G. E. 2008.** The response of broiler finisher birds fed graded levels of yam peel meal in place of maize-based diets. International Journal of Poultry Science 7(5):474-479

[7]. **Nguyen, V. T. 2015.** Livestock production systems adapting to the global crises in tropical developing countries.A review. Journal of Science, DOI: 10.22144/ctu.jen.2015.033. 01: 69-80.

[8]. **Nguyen, V. T. 2019 .** Rabbit production adapting to climate change. A Review. Rabbit as Future Livestock for Sustainable Development: International Conference on Rabbit Production in Tropical Climate 2019 and 4th Asian Rabbit Production Association Conference Tamarind Square Cyberjaya, Selangor, Malaysia. 5 & 6 August 2019: MARBA, 2019

[9]. **Aduku, A. O. and olukosi, J. O. 1990.** Rabbits Management in the tropics production, processing, utilization, marketing. Economics practical training, research and future prospect, living book series, G.U. publication, Abuja F.C.T. pp 1-105.

[10]. **A.O.A.C. 1990.** Official methods of analysis of the AOAC, 15th ed. Methods 932.06, 925.09, 985.29, 923.03. Association of official analytical chemists. Arlington, VA, USA

[11]. **Al-Dobaib, S.N. 2009.** Effect of diets on growth, digestibility, carcass and meat quality characteristics of four rabbit breeds. Saudi Journal of Biological Sciences (2010) 17, 83–93.

[12]. **Balogun, K. B., Ogunsipe, M. H., Ayoola, M. A., Oladepo, A. D. and Ale, A. B. 2016 .**Effect of sweet orange (Citrus sinensis) peel meal (SOPM) on the growth performance, carcass attributes and economics of production of rabbits. Science & Technology 2(6), 187-194.

[13]. **SAS, 2004.** Statistical Analysis System, SAS Institute, Inc. Cary N. C. USA.

[14]. **Duncan, D.B. 1955.** Multiple range test. Biometrics, 11:1-42.

[15]. **Uchewa, E. N. Orogwu, C. E., & Nwakpu, P. E. 2014.** Effect of Yam Peel Meal (YPM) Replacement for Maize on the Growth Performance and Carcass Traits of Weaner Rabbits. International Journal of Agriculture Innovations and Research, 2 (4), 536–541.

[16]. **Haruna, I. M., Muhammad, A. S., Jabil, I. Y. and Simon, E. 2018.** The use of yam peel meals (YPM) as a source of energy in concentrate diet for rabbits International Journal of Science and Applied Research (IJSAR) 3: 1

[17]. **Jiwuba P. C, and Okechukwu, O. S. 2018.** Effects of Cassava and Yam Peel Meals on Carcass Traits and Economics of Production of Finishing Broilers. Advance in Nutrition Feed Science: ANAFS-103

[18]. **Ezieshi, E. V. and Olomu, J. M. 2011.** Bio-chemical evaluation of yam peel meal for broiler chickens. Journal of Agriculture and Social Research (JASR) 11: 1.

[19]. **Oyewole, B. O., Aribido, S. O. and Isah, R. 2013.** Performance of growing rabbits fed yam (Dioscorea rotundata) peel meal supplemented with limestone treated cashew (Anacardium occidentale) nut shell, Bambaranut and burukutu wastes. Proceedings of the 18th Annual Conference of Animal Science Association of Nigeria. Akpan G.A., Dairo, F.A.S, Bawa, G.S., Solomon,I. P., Amaefuele, K.U. Odunsi, A.A and Ladokun, A.O(editors) September, 8 -12, Abuja

[20]. **Ribikauskiene, D. Macijauskiene, V. Jeresiunas, A. Ribikauskas, V. and Stuoge, I. 2015.** Comparative evaluation of two different ration types for growing rabbits. Bulgarian Journal of Agricultural Science, 21 (No 1), 193-198

[21]. **Akinmutimi, A. H. and Anakebe, O.C. 2008.**Performance of weaner rabbits fed graded levels of yam and sweet potato in place of maize base diets. Pakistan Journal of Nutrition, 7 (5): 700-704.

[22]. **Ojabiyi, O. O., Olarinde, O. J., Adepoju, A. A., Akinola, A.O. and Adetutu, O.J. 2013.**Comparative performance of rabbits on exclusive day and/or night feeding regime in the drived Savanna zone of Nigeria. Proceedings of the 18th Annual Conference of Animal Science Association of Nigeria. Akpan G.A., Dairo, F.A.S, Bawa, G.S., Solomon,I. P., Amaefuele, K.U. Odunsi, A.A and Ladokun, A.O(editors) September, 8 -12, Abuja.

[23]. **Rajendran, R., Prakash, S and Selvan, S. T. 2019.** Carcass weight and cut up parts yield in New Zealand white rabbits of marketable age under tropical conditions. Rabbit as Future Livestock for Sustainable Development: International Conference on Rabbit Production in Tropical Climate 2019 and 4th Asian Rabbit Production Association Conference Tamarind Square Cyberjaya, Selangor, Malaysia. 5 & 6 August 2019: MARBA, 2019

Amaza, et. al. "Evaluation of Yam peels meal as replacement of maize on the growth performance, carcass characteristics and cost benefits of growing rabbits." *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*, 14(4), 2021, pp. 44-48.