JOURNAL OF SCIENCE, TECHNOLOGY, MATHEMATICS AND EDUCATION (JOSTMED)

ISSN: 0748 – 4710

VOLUME 13(3), SEPTEMBER, 2017

WELCOME TO JOSTMED

Welcome to the Journal of Science, Technology, Mathematics and Education (JOSTMED). The JOSTMED is a scholarly based journal published thrice in a year by the Department of Science Education, School of Science and Science Education, Federal University of Technology, Minna, Nigeria, since September 1998. The scope of the Journal includes the research, development, and practice in all areas of Science, Technology, Mathematics and Education.

INSTRUCTIONS TO CONTRIBUTORS

1. General Guidelines

(i) **Types of Manuscripts:** The Editorial Board of the Journal of Science, Technology, Mathematics and Education accepts only scholarly and original articles that meet its aim and scope. Contributions must be original, therefore, authors is/are to guarantee that their article is original and not currently being considered for publication elsewhere.

(ii) **Language:** The JOSTMED is published in English Language.

(iii) **Length:** Usually full-length article, survey or report should be between 3,000 - 5,000 words (12 – 15 pages).

(iv) **Abstract and Keywords:** Each article should be summarized in about 150 -200 words, serving as a brief description of the content of the article. In addition, following the abstract, supply 4 - 5 keywords/phrases that characterize the content of the paper and which can be used for indexing purposes.

(v) **Manuscript:** Manuscripts, including the abstract and references, should be typed double-spaced on A4 paper set-up using Times New Roman, 12 font size.

(vi) **Review:** Each submission will be subjected to blind peer-review by at least two experts in the fields of the articles. Before the publication of accepted article, corresponding authors will receive a PDF version of their manuscript for final proofing. It should, however, be emphasized that changes in content (new or additional results, corrected values, changes in article title, etc) are not permitted without the approval of the Managing Editor.

2. Copyright

Only original papers will be accepted and processed. Paper accepted will be subjected to viper anti-plagiarize detector software. In addition, no compensation will be given in respect of published papers. However, authors reserve the right to use their own materials for purely educational and research purposes.

3. Format of Submitted Manuscripts

All manuscripts, written in good English, should be submitted electronically as an e-mail attachment (in Microsoft Word format not scanned copy) to the journal e-mail: jostmed@futminna.edu.ng, jostmedscience@yahoo.com or managing editor's e-mail: gambarii@yahoo.com, gambari@futminna.edu.ng.

In a rear occasion, when submitting manuscript in a paper version three copies should be submitted in double line spacing with wide margins, and not more than 12 pages with illustrations inserted. Extra page will attract additional amount of N1,000.00/$7.00 per page. Each article submitted must be accompanied with an assessment fee of three thousand naira (N3,000) only in cash or bank draft in favour of the Managing Editor (JOSTMED). Submission of manuscript is accepted throughout the year.

The beginning of the manuscript must bear the title of the paper and the full names of authors and their affiliations for correspondence (including e-mail and telephone number). Where there are two or more authors include the addresses for correspondence (e-mail and postal addresses) for the contact author.

Once the article is accepted for publication, the final version should be submitted online. Where that is not possible, the manuscript must be provided, accompanied by a Recordable CD of the same version labelled with: author name(s); titles of article and file name. The author must ensure that the final submission is complete, grammatically correct and without spelling or typographical errors. In preparing the disk, please use Microsoft Word. The sum of Fifteen Thousand (N15,000) naira only (£50.00 or $100 US Dollar) should be paid to journal account.
The online version of the published articles are available at www.futminna.edu.ng and can be accessed through the Internet free of charge.

4. Organization
The background and purpose of the manuscript should be given first, followed by details of methods, materials, procedures and equipment used (where applicable). Findings, discussion, conclusions and recommendations should follow in that order. Appendices are not encouraged, but may be countenanced if considered necessary for the manuscript content to be understood. Specifically, author is/are advised to consult the current APA Manual for the details they may need.

5. Figures and Tables
Figures, charts and diagrams should be kept to a minimum, they must be numbered consecutively with roman numerals and a brief title. When submitting electronically, figures should be prepared separately, numbered consecutively and submitted in one of JPEG File interchange (jpg), CompuServe GIF (gif), and PC Paintbrush (pcx). Images should not exceed width of 450 pixels.

6. References
The author should ensure that the references given are complete. References to personal letters, papers presented at meetings and other unpublished material may be included. Where such materials may help in the evaluation of the paper, copies should be made available to the Managing - Editor. Papers that are part of a series should include a citation of the previous papers, and explanatory materials may be appended to the manuscript to avoid footnotes. Citation of an author's work in the text should follow the author / date method of citation; the surname of the author (s) and year of publication should appear in text. Generally, the format for citations in the Manuscript for references is that of the latest edition of the American Psychological Association (APA) format. At the end of the article, a reference list in alphabetical order must be given.

7. Disclaimer
The views and styles expressed in the articles in this publication are those of the individual authors and are not necessarily shared by the reviewers, the editors, the editorial consulting board, the Department of Science Education, or the Federal University of Technology, Minna.

Dr. Gambari, A. I.
Associate Professor of Educational Technology
The Managing Editor, (JOSTMED),
Department of Science Education,
Federal University of Technology,
P. M. B. 65, Minna, Niger State, Nigeria.
E-mail: gambarii@yahoo.com; gambariisiaka@gmail.com
gambari@futminna.edu.ng ; gambari@codel.futminna.edu.ng
Website: www.gambariamosaisiaka.com.ng
Mobile Phone: +234-816-680-7534; +234-803-689-7955; +234-805-558-6716

EDITORIAL BOARD

SUSCRIPTION RATES

Nigeria Rate (Personal)	₦1,000.00
Rate (Institutions)	₦2,000.00
Other Countries Rate (Personal)	$25.00 / £15.00
Rate (Institutions)	$35.00 / £22.00

All Cheques should be made payable to:

The Managing Editor, JOSTMED, Department of Science Education,
Federal University of Technology, Minna, Nigeria.
Subscription must be pre-paid and must include 10% handling charges

Copyright ©

ISSN 0748-4710

CONTRIBUTORS TO THE ISSUE

1. **ONOJA M. A.[1]; EWA, I. O. B.[2]; OLADIPO, M. O. A.[2]; JONAH, S. A.[2]; & NASIRU, R.[1]**
[1]Department of Physics, Ahmadu Bello University, Zaria, Nigeria
[2]Centre for Energy Research and Training, Ahmadu Bello University, Zaria, Nigeria
Email: Gtob2014@gmail.com **Phone No:** +234-805-073-4928

2. **ADABARA, N. U[1].; KUTA, F. A[1].; BALA, J. D[1].; ADELERE, I. A.; ADEDEJI, A. S.[1].; ZAKARI, H.[2]; & TIJANI, R[1].**
[1]Department of Microbiology,
Federal University of Technology, Minna, Niger State, Nigeria.
[2]Department of Microbiology,
University of Jos, Jos, Plateau State, Nigeria.
E-mail: nasiru.adabara@futminna.edu.ng **Phone No:** +234-806-909-2576

3. **IDOWU, F. C.; & IJAH, U. J. J.**
Department of Microbiology,
Federal University of Technology Minna, Nigeria
E-Mail: Folabambi@gmail.com **Phone No:** +234-703-706-3073

4. **UDIM SUNDAY SAMPSON[1] & OJOYE, S.[2]**
Department of Geography,
Federal University of Technology, Minna, Nigeria
Email: Udimsundaysampson168@yahoo.Com. **Phone No:** +234-803-058-9944

5. **STELLA AMARACHUKWU ONWUKANJO (PhD) CLN**
Library and Information Technology Department,
Federal University of Technology, Minna, Niger State, Nigeria
Library and Information Technology Department,
Federal University of Technology, Minna, Niger State, Nigeria
E-Mail: stellaradiant@yahoo.com, onekpemaureen@gmail.com
Phone No: +234-802-341-7566, +234-703-926-5995

6. **AREKEMASE, M. O.[1]; LAWAL, A. K.[1]; ADAM, A. I.[1]; OLABANJI, S. O.[1]; OROGU, J. O.[2]; & AHMED, T.[3]**
[1]University of Ilorin, Faculty of Science,
Department Of Microbiology, P.M.B 1515, Ilorin, Kwara State, Nigeria
[2]Delta State Polytechnic, School of Science and Technology,
Department of Science Laboratory Technology, Ozoro, Delta State, Nigeria.
[3]Department of Laboratory Science Laboratory Technology,
Kwara State Polytechnic, Ilorin, Nigeria
E-Mail: Arekemase.om@gmail.com,
Phone No: + 234-803-0420-658, +234-706-324-1408

7. **AYANDA, I. F.; & SALAWU, O. L.**
Department of Agricultural Economics and Extension Services,
College of Agriculture, Kwara State University, Malete. Nigeria
Email: Latifaht22@yahoo.com, **Phone No:** +234-806-585-0886

8. MALIK, A. A.; KUDU, Y. S.; IBRAHIM, M. J.; GARBA, P. C.; & KOMO, T. S.
Department of Animal Production,
Federal University of Technology, Minna, Niger State, Nigeria
E-Mail: delemalik@gmail.com **Phone No:** +234-803-063-7763

9. RAUF, K.; & USAMOT, I. F.
Department of Mathematics, University of Ilorin, Ilorin, Nigeria.
E-mails: Krauf@Unilorin.edu.ng; usamot.if@Unilorin.edu.ng
Phone No: 234-814-641-6645

10. HAKIMI, D.; & BATAGI, S., A.
Department of Mathematics, Federal University of Technology, Minna, Nigeria
E-Mail: Hakimi_shenfu@yahoo.Com, alhajibatagishehu@yahoo.com
Phone No: +234-803-451-3313

11. ADETUTU[1], O. M.; OGUNTOLU[2], F. A.; & ABDULLAHI[3], U.
[1, 3]Department of Statistics, Federal University of Technology, P. M. B. 065, Minna
[2] Department of Mathematics, Federal University of Technology, P. M. B. 065 Minna
E-Mail: ola.adetutu@futminna.edu.ng **Phone No:** +234-816-611-9526

12. ADEDAPO, A., Ph.D
Emmanuel Alayande College of Education, Oyo, Oyo State, Nigeria
E-Mail: dapyem09@gmail.com **Phone No:** +234-803-391-0680

13. NUHU, M. SANI[1]; ALKALI BABAWUYA[2]; LAWAL SADIQ S[3]; ENEBE VINCENT[4]; & IDRIS ABUBAKAR MOHAMMED[5]
[1]Department of Industrial Education, Waziri Umaru, Federal Polytechnic, Birnin Kebbi
[2&3]Department of Mechatronics Engineering, Federal University of Technology, Minna
[4]Department of Mechanical Engineering,
Modibbo Adama Univeristy of Technology, Yola, Nigeria
[5]Department of Industrial & Technology Education,
Federal University of Technology, Minna, Nigeria
E-mail: babawuya@futminna.edu.ng **Phone No:** +234-703-809-6888

14. SUNDAY ADE, ADENIRAN, PhD[1],; ATSUWE BERNARD AONDOFA[2]; & EMMANUEL GODBLESS EJIKE[3]
[1,2] Department of Science Education,
Federal University of Agriculture Makurdi, Benue State
[3]Fruit of Faith Secondary School Makurdi, Benue State, Nigeria
E-mail: ascentade@yahoo.com **Phone No:** +234-803-436-2037

15. DR. (MRS.) JIYA ALICE[1]; DR. (MRS.) OLORUKOOBA, S. B.[2]; DR. (MRS.) LAWAL, F. K.[3] & PROF. (MRS.) LAKPINI, M. A.[4]
[1]Niger State College of Education, Minna, Niger State
[2&3]Department of Science Education, Ahmadu Bello University, Zaria, Nigeria
Department of Science Education, Ahmadu Bello University, Zaria, Nigeria
[4]Institute of Education, Ahmadu Bello University, Zaria, Nigeria
Phone No: +234-803-601-8647

16. **OGUNLADE, OYERONKE OLUFUNMILOLA, PhD; & ANAZA, ABDULMUMUNI ONUYI, PhD**
[1]Department of Educational Technology, University of Ilorin, Ilorin, Nigeria
[2]Department of Curriculum and Instruction,
Federal College of Education, Okene, Nigeria
E-mail: ogunlade.oo@unilorin.edu.ng, anazaao74@gmail.com
Phone No: +234-803-245-5690, +234-816-581-8332

17. **IBRAHIM, ISMAIL KUTA, PhD; TUKURA, SAIDU CHARLSE, PhD; IDRIS, OMENEKE ATIKATU MOHAMMED; AMINA NANA; ALI, FATI; & NNDATSU, ABDULKADIR**
Department of Educational Technology, Federal University of Technology, Minna,
Department of Science Education, Federal University of Technology, Minna, Nigeria
E-mail: ibrahimkuta@futminna.edu.ng **Phone No:** +234-803-583-7865

18. **Wakili, B. Y, NsoforG.N, Suleiman, Y. M and Emigilati, M A.**
Department of Geography, Federal University of Technology, Minna, Nigeria
Email: balawakili4real@gmail.com **Phone No:** +234-813-158-7607

19. **SALIU, R. M., GAMBARI, A. I. PHD, UMEH, A. PHD**
Department of Educational Technology,Federal University of Technology, Minna, Nigeria
E-mail: gambari@futminna.edu.ng **Phone No:** +234-803-689-7955

20. **YUSUF, H. T. (Ph.D)[1], ODUTAYO, A. O.[2], AKINTOLA, M.[2], & YUSUF, A. O.[1]**
[1]Department of Social Sciences Education, Faculty of Education, University of Ilorin, Ilorin, Nigeria
[2]Department of Educational Foundations and Counseling Psychology, Faculty of Education, Lagos State University, Ojo.
E-mail: o_odutayo@outlook.com **Phone No:** +234-803-395-3944

GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF GUINEA PIGS (*Cavia porcellus*) FED DIETS CONTAINING PLANTAIN PEEL MEAL AS A REPLACEMENT FOR MAIZE

MALIK, A. A.; KUDU, Y. S.; IBRAHIM, M. J.; GARBA, P. C.; & KOMO, T. S.
Department of Animal Production,
Federal University of Technology, Minna, Nigeria
E-mail: delemalik@gmail.com **Phone No:** +234-803-063-7763

Abstract
An eight weeks (56 days) feeding trial was conducted on 4 – 6 weeks' old growing guinea pigs totaling 24 of mixed sexes, to evaluate their growth performance when fed diets containing graded levels of plantain peel meal (Musa paradisiaca) at 0 %, 10 %, 20 % and 30 % dietary inclusion levels, to form Diet T_1, T_2, T_3 and T_4 respectively. The animals were randomly divided into four groups of six animals each and each group sub-divided into three replicates of two guinea pigs per replicate in a Completely Randomized Design experiment (CRD). The experimental diets and clean drinking water were offered to the growing guinea pigs ad libitum. Data were collected on feed intake and weight gain. At the end of the 8^{th} week, three animals were randomly selected per treatment (one from each replicate), slaughtered with a knife by severing their jugular veins and their carcass characteristics determined. Results show that there were no significant ($p>0.05$) differences in initial body weight, final body weight, total body weight gain and total feed intake among the treatments. However, feed conversion ratio (FCR) was significantly ($p<0.05$) better for the Control Diet than for the plantain peel meal diets. There were no significant ($p>0.05$) differences in all the carcass characteristics determined and in all the cut-up parts between guinea pigs fed diets containing varying levels of plantain peel meal. The heart showed significant ($p<0.05$) differences; all the other organs such as thorax, intestine, liver, kidney, gall bladder, lungs and spleen showed no significant ($p>0.05$) differences among the treatments. Hence, it can be concluded that plantain peel meal can be included up to 30 % in the diet of growing guinea pigs with no detrimental effects on their growth performance and carcass characteristics.

Keywords: *Growth performance, carcass characteristics, plantain peel meal, guinea pigs*.

Introduction

In Nigeria, the animal protein intake has been on the decline as a result of the ever increasing population (World Health Organization, 1985). Due to the inability of the conventional livestock to bridge the ever widening gap between animal protein supply and demand in Nigeria, attention has now been shifted on the microlivestock; for them to make significant contributions towards improving the status of animal protein consumption in Nigeria. These microlivestock include rabbit, grasscutter, snail and guinea pig. Guinea pig (*Cavia porcellus*) is a rodent considered to be a very promising microlivestock species for rural development because it requires little capital, equipment, space and labour (Nr-International Managers of the Livestock Production Programme, 2006). It provides an inexpensive, readily available and high quality meat that is nutritious and has higher protein content than that of poultry, pork, mutton and beef (Numbela and Valencia, 2003). Guinea pig originated in the Andes Mountain of South America, where they are still of importance as meat animals and have a role in religious ceremonies and local medicine (Muller-Hey, 1984).

In the tropical and subtropical countries of the world, there is active search for alternative feed resources for animal feeding. This is to allow the total or partial substitution of cereals, such as maize, traditionally employed for feeding livestock, because of their high cost and competition between man and livestock. Plantain peel is amongst the feed ingredients that are regarded as wastes that could potentially substitute for conventional ingredient like maize, due to its agro-ecological advantages in tropical areas, such as high yields in fruits (Machin, 1992). Plantain peels have been used by certain researchers as potential feed ingredients in monogastrics (Nwokolo, 1990; Scott, 1992). Ajayi *et al.* (2006) fed sun-dried ripe plantain peel meal to weaner rabbits as a replacement for maize and determined that it can be used to replace maize up to 75 % in the diet of rabbit so as to reduce the total feed cost which constitute above 60 % of production cost. Less attention has been paid to the potential advantage of the use of an integrated plantain peel-guinea pig production system (González*,* 1994), where the use of the peel could decrease the feeding costs in guinea pig production (González and Díaz, 1997). Hence, the objective of this study was to evaluate the growth performance and carcass characteristics of growing guinea pigs fed graded levels of plantain peel meal as a replacement for maize.

Materials and Methods

Study Location: The experiment was carried out at the Rabbitry Unit of Niger State Ministry of Livestock and Fisheries, Bosso, Minna. Minna is located on latitude 9^0 28′ to 9^0 37′ North and between longitude 6^0 23′ to 6^0 33′ East. It has an annual mean precipitation range of 1000 – 1500 mm and temperature range of 28^0C to 34^0C (NSADP, 1995).

Preparation of Plantain Peel Meal: Plantain peels were collected from restaurants and eateries within Minna metropolis. They were then sun-dried for between 5-7 days, during the months of February and March, until properly dried. Thereafter, they were milled using an attrition mill and sieved through a 2 mm sieve. The ground powdery product obtained were then stored in plastic containers until needed for compounding of the experimental diets.

The Experimental Diets: The ingredients used in formulating the experimental diets were maize, groundnut cake, wheat offal, palm kernel cake, fish meal, bone meal, salt, lysine, methionine, palm oil and premix. They were all purchased from agro-veterinary and feed milling stores in Minna. Plantain peel meal were included in the experimental diets at 0, 10, 20 and 30 % dietary inclusion levels to form Diet T_1, Diet T_2, Diet T_3 and Diet T_4 respectively. The percentage composition of the experimental diets is shown in Table 1.

Table 1: Percentage and calculated composition of the experimental diets

Ingredients	Diet T_1	Diet T_2	Diet T_3	Diet T_4
Maize	50.00	40.00	30.00	20.00
Plantain peel meal	0.00	10.00	20.00	30.00
Groundnut Cake	26.15	23.65	23.65	23.65
Wheat offal	11.00	13.50	13.50	13.50
Palm kennel cake	6.00	6.00	6.00	6.00
Fish meal	2.00	2.00	2.00	2.00
Bone meal	2.00	2.00	2.00	2.00
Salt	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20

Palm oil	2.00	2.00	2.00	2.00
*Premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated Composition				
Metabolizable energy	2769	2696	2730	2707
Crude protein	20.77	20.43	20.09	20.07

*Premix has the following composition: Vitamin A = 7,500, 00 IU, D = 500, 000 IU, E = 1,000 IU, B_1 = 375 mg, B_2 = 125 mg, B_3 = 500 mg, B_6 = 150 mg, B_{12} = 2.5 mg, K= 15 mg, C = 10 mg and folic acid = 150 mg. Minerals: Ca = 12.5 mg, Cu = 8.0 mg, 1 = 0.8 mg, Se = 100 mg, Mg = 0.25 mg, chlorine = 250 mg, pantothenic acid = 144 mg.

T_1 = Diet 1 with 0% Plantain Peel meal *T_2 = Diet 2 with 10% Plantain Peel meal*
T_3 = Diet 3 with 20% Plantain Peel meal *T_4 = Diet 4 with 30% Plantain Peel meal*

Experimental Animals and their Management

The animals used for this experiment were obtained from Kontagora in Niger State. Twenty-four (24) growing guinea pigs aged between 4-6 weeks were randomly allotted to four dietary treatments with three replicates each; and with two animals per replicate. The guinea pigs were placed in individual hutches made up of wood and wire mesh, measuring 60 cm x 65 cm x 60 cm. Before the arrival of the animals, the hutches were cleaned and thoroughly disinfected using MORIGAD®. Cleaned and disinfected feeders and drinkers were placed in the hutches. On arrival, the guinea pigs were acclimatized in the hutches for one week; during this time, they were fed the control diet and forages. Antibiotics and coccidiostats were then administered to the animals before the commencement of the experiment as prophylactic treatments against bacteria and coccidia infections. The experiment lasted for eight weeks. On commencement of the experiment, the guinea pigs were fed the experimental diets twice daily, in the morning and in the evening; to ensure that feed were always available to them. Supplemental forages were offered to the animals in the evening as extra sources of fibre. Clean drinking water were also offered daily to the animals.

Parameters Determined

Feed were weighed daily before being offered to the animals per replicate and the leftover (uneaten) feed removed the following day and weighed. Daily feed consumption per replicate were obtained by subtracting the weight of the leftover feed from the weight of the feed supplied. The body weights of the guinea pigs were also taken at the beginning of the experiment. Thereafter, the guinea pigs were weighed weekly with a top loading weighing scale (measuring to the nearest 0.01 g), to determine their weekly weight gains. Body weight gain for each week was obtained by difference between body weight of the preceding week and the present week. At the end of the growth trial, three guinea pigs from each treatment were randomly selected for carcass analysis. The guinea pigs were kept off feed for 12 hours before slaughter. They were slaughtered with a knife by severing the jugular vein after which they were kept head down in order to drain them of blood so as to get their slaughter weight. They were then skinned using a sharp knife, eviscerated, and the cut-up parts were removed carefully and weighed.

Chemical Analysis
The proximate compositions of the plantain peel meal as well as that of the experimental diets were determined using the procedures of AOAC (1990).

Statistical Analysis
Data obtained from this research work were subjected to statistical analysis using SAS Package (Statistical Analytical Systems, 2000 Version) based on a Completely Randomized Design Model. Where the means were significant, they were separated using Duncan Multiple Range Tests as contained in the Package.

Results and Discussion
Table 2 shows the proximate composition and energy value of plantain peel meal. It shows that plantain peel meal has dry matter content of 93.00 %, crude protein content of 12.25 %, crude fibre content of 8.67 %, ash of 23.00 %, ether extract of 15.00 % and nitrogen free extract of 34.08 %. Estimated metabolizable energy (Pauzenga, 1984) was 2878 Kcal/kg. These results are similar to the nutritional value of plantain peels reported by Aduku, (1993). According to the author, plantain peel though a waste, has good nutritional value as it contains about 11 % crude protein, 6 % crude fibre and 12 % ash. The metabolizable energy value of plantain peel is close to that of maize (3432 Kcal/kg) indicating that it can easily substitute for maize in the diet of guinea pigs.

The result of growth performance of guinea pigs fed diets containing varying levels of plantain peel meal is shown in Table 3. There were no significant ($p > 0.05$) differences in initial body weight, final body weight, total body weight gain and total feed intake among the treatments. However, feed conversion ratio (FCR) was significant ($p<0.05$) among the treatments with guinea pigs on the Control Diet having significantly ($p<0.05$) better FCR than the other plantain peel meal diets. Hence, FCR was not significantly ($p>0.05$) different among the plantain peel meal diets, showing that increasing the dietary inclusion level of plantain peel meal from 10 % (Diet 2) to 30 % (Diet 4) did not significantly affect the growth performance parameters among the growing guinea pigs.

Table 2: Proximate composition and energy value of plantain peel meal

Parameters	% Composition
Moisture	7.00
Dry matter	93.00
Crude Protein	12.25
Crude fibre	8.67
Ash	23.00
Ether extract	15.00
Nitrogen free extract	34.08
Metabolizable energy (Kcal/kg)	2878

Table 3: Growth performance of growing guinea pigs fed diets containing varying levels of plantain peel meals as a replacement for maize

Parameter	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**	**LOS**
Initial weight (g)	256.83	241.50	250.00	236.67	9.06	NS
Final weight (g)	551.30	520.42	551.67	525.25	9.71	NS
Total weight gain (g)	294.47	278.92	300.58	285.58	8.14	NS

Total feed intake (g)	1295.49	1497.64	1571.76	1571.76	54.50	NS
Feed conversion ratio	4.40[a]	5.37[b]	5.61[b]	5.52[b]	0.19	**

[ab] Means with different superscripts on the same row were significantly ($p < 0.05$) different

T_1 = Diet 1 with 0% Plantain Peel meal *T_2 = Diet 2 with 10% Plantain Peel meal*
T_3 = Diet 3 with 20% Plantain Peel meal *T_4 = Diet 4 with 30% Plantain Peel meal*
SEM = Standard error of mean *LOS = Level of significance*
NS = Not significant at α = 5% *** = Significant at α = 5%*

There were no significant ($p>0.05$) differences in all the carcass characteristics determined (slaughter weight, eviscerated weight and dressed weight); also there were no significant ($p>0.05$) differences in all the cut-up parts (head, forelimbs, hindlimbs, neck, legs, skin and lumbar) between guinea pigs fed diets containing varying levels of plantain peel meal (Table 4 and Table 5). For the internal organs determined, only the heart showed significant ($p<0.05$) differences among the treatments; all the other organs such as thorax, intestine, liver, kidney, gall bladder, lungs and spleen showed no significant ($p>0.05$) differences among the treatments (Table 6). This result is similar to the findings of Ogunsipe and Agbede (2010) when they fed unripe plantain peels to weaner rabbits as a replacement for maize. Significant ($p<0.05$) differences were found in the weight of the lungs, kidneys and heart between rabbits fed diets containing unripe plantain peels replacing 0, 25, 50 and 75 % maize. They concluded that dietary treatments exert some influences on certain carcass and organ developments. Huss and Roca (1982) and Cicogna *et al.* (1992) reported a dressing percentage of 65 % and 76 % respectively for guinea pigs. The value reported in this present study is quite lower than those earlier reported. This may be due to breed differences as well as differences in climate and environmental conditions under which the guinea pigs were managed.

Table 4: Carcass characteristics of guinea pigs fed varying levels of plantain peel meal as a replacement for maize

Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**	**LOS**
Live weight (g)	287.50	297.20	275.00	275.00	17.70	NS
Slaughter weight (%)	98.59	96.57	98.17	98.04	1.34	NS
Dressed weight (%)	57.56	56.88	60.88	66.29	6.60	NS
Eviscerated weight (%)	70.45	69.91	73.76	71.52	2.14	NS

T_1 = 0% plantain peel meal inclusion in the diet T_2 = 10% plantain peel meal inclusion in the diet
T_3 = 20% plantain peel meal inclusion in the diet T_4 = 30% plantain peel meal inclusion in the diet
NS = Not significantly different ($p>0.05$) LOS= Level of significance
SEM = standard error of the mean

The non-significant differences among the treatments in the carcass characteristics, cut-up parts and internal organs is an indication that the carcass of the guinea pigs were not significantly ($p>0.05$) affected by the consumption of different levels of plantain peel meal diets. This could be a pointer to the nutritional adequacy of plantain peel meal in the diets of guinea pigs.

Conclusion

The result of this research work shows that growing guinea pigs can be fed with plantain peel meal based diets as a replacement for maize with no adverse effect on their growth performance and carcass characteristics. Hence, plantain peel meal can be included up to 30 % in the diet of growing guinea pigs as a replacement for maize.

Table 5: Cut-up parts of guinea pigs fed varying levels of plantain peel meal as a replacement for maize (expressed as % of live weight)

Parameters	T_1	T_2	T_3	T_4	SEM	LOS
Head	1.33	1.37	1.46	1.45	0.50	NS
Fore limbs	6.72	6.85	6.35	7.14	0.16	NS
Hind limbs	7.06	6.75	6.31	7.36	0.19	NS
Neck	4.30	4.70	4.47	4.60	0.16	NS
Legs	2.48	2.90	2.74	2.28	0.12	NS
Skin	12.89	13.04	12.88	12.42	0.35	NS
Lumbar	8.97	10.06	8.98	10.93	0.38	NS

T_1 = 0% plantain peel meal inclusion in the diet T_2 = 10% plantain peel meal inclusion in the diet
T_3 = 20% plantain peel meal inclusion in the diet T_4 = 30% plantain peel meal inclusion in the diet
NS = Not significantly different (p>0.05) LOS= Level of significance
SEM = standard error of the mean

Table 6: Weight of internal organs of guinea pigs fed varying levels of plantain peel meal as a replacement for maize (expressed as % of live weight)

Parameters	T_1	T_2	T_3	T_4	SEM	LOS
Thorax	6.69	6.05	6.31	6.34	0.36	NS
Intestine	23.88	22.90	21.63	24.62	0.98	NS
Liver	5.05	4.13	4.08	3.75	0.24	NS
Kidney	1.19	1.20	1.35	1.40	0.10	NS
Gall bladder	0.11	0.10	0.10	0.09	0.01	NS
Lungs	1.06	1.21	1.13	1.18	0.03	NS
Heart	0.35^{ab}	0.29^{b}	0.36^{ab}	0.42^{a}	0.21	*
Spleen	0.00	0.00	0.00	0.02	0.00	NS

^{a,b} Means denoted by different superscripts were significantly different (p<0.05)

T_1 = 0% plantain peel meal inclusion in the diet T_2 = 10% plantain peel meal inclusion in the diet
T_3 = 20% plantain peel meal inclusion in the diet T_4 = 30% plantain peel meal inclusion in the diet
NS = Not significantly different (p>0.05)LOS= Level of significance
SEM = standard error of the mean

References

A. O. A. C. (1990). *Association of official analytical chemists: Official methods of analysis, 15th edition.* Washington DC.

Aduku, A. O. (1993). Tropical feedstuff analysis Table. Nutrient requirements of animals. Unpublished Thesis, Ahmadu Bello University, Samaru-Zaria, Nigeria.

Ajayi, F. O., Omole, A. J., Olukotun, J. A., Obi, O. O. & Owosibo, A. (2006). Performance characteristics of weaned rabbit fed plantain peel as replacement for maize. *World Journal of Zoology, 1(1), 30-32.*

Cicogna, M., Castrovilli, C., & Rigoni, M. (1992). Guinea Pig (L.) Raising for meat production: Researches on different husbandry aspects. In: *Proceedings of the Seminar "Invertebrates (Micro-Livestock) Farming". Philippines. Novermber, 1992.*

Gonzàlez, C. (1994). Utilization de batata (*Ipomoea batatas* L.) en la alimentacion de credos en confinamiento en pastoreo. PhD Thesis, Central University, Venezuela, Maracay.

Gonzàlez, C. & Diaz, A. (1997). International scientific meeting (Animal Science Institute), Habana, p. 33.

Huss, D. L., & Roca, G. (1982). Small animals for small farms: The Guinea pig and a hypothetical development centre. FAO Regional Office for Latin America, Santiago, Chile.

Machin, D. H. (1992). Overview of needs and justification for use of roots, tubers, plaintains and bananas in animal feeding In: roots, tubers, plantain and bananas in animal feeding (D. Machine and S. Nvyold, editors). FAO animal production and health paper No 95, Rome, p 1-10.

Muller-Hey, B. (1984). Guinea pig or Cuy. In: Evaluation of domesticated animals (I. L. Mason, editor). Longman Group Ltd, Harlow Essex, UK.

Nr-International Managers of the Livestock Production Programme (2006). Guinea Pigs. In: small stock in development, 2pp.

NSADP (1995). Niger state agricultural development project. 31st Quarterly Report. January-March. In: Nigerian Agro Newsletter, Vol.3, No. 2, July – December, 1995, pp.32 – 33.

Numbela, E. R., & Valencia, C. R. (2003). Guinea pig management manual.

Nwokolo, E. (1990). Sweet Potato. In: Non-traditional feed sources for use in swine nutrition (P. A. Thacker and R. N. Kirkwood, editors). London: Butterworths, Pp. 481-491.

Ogunsipe, M. H. & Agbede, J. O. (2010). The replacement value of unripe plantain peels on the growth performance, carcass characteristics and cost implications of rabbit production in the tropical region. *Researcher,* 2(11), 24-29.

Pauzenga, G. (1984). Feeding parent stock. *Journal Zoo Technical International,* 1, 22-23.

SAS (2000). Statistical Analytical Systems. *User's Guide*, SAS Institute, Cary, North Carolina, USA.

Scott, G. J. (1992). Sweet potatoes as animal feed in developing countries: Present pattern and future perspective. In: Roots, Tubers, Plantain and Bananas in Animal Feeding (D. Machine and S. Nyyold, editors), FAO Animal Production and Health Paper No 95, Rome, p. 183-202.

WHO (1985). World health organization energy and protein requirements: Report of a joint FAO/WHO/UNU expert consultation. Technical Report Series 724. Geneva: World Health Organization. P, 206.