# GROWTH RATE AND HAEMATOLOGICAL PARAMETERS OF WEANER RABBITS FED ON TIGER (*Cyperus esculentus*) NUT MEAL-BASED DIETS

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**Abstract**

*Twenty crosses of Californian x New Zealand breeds of weaner rabbits averaging 4 to 6 weeks old of mix sexes were used to investigate their growth rate and haematological parameters using tiger nut offal (TNO) meal-based diets in a 35d experiment. The rabbits were randomly allotted to 5 treatment groups and replicated 4 times. Each replicate had 1 rabbit that was housed individually in a cage. The rabbits were fed twice daily (7.00am and 4.00pm) and had access to drinking water at all times. Feeding troughs and drinkers were provided in each cage and a known quantity of feed was supplied daily. Five diets $T_1$, $T_2$, $T_3$, $T_4$ and $T_5$ were compounded to be iso-nitrogenous (18% CP) and iso-caloric (2700 ME kcal/kg), TNO was included in the diets at 0, 5, 10, 15 and 20%, respectively. Performance data were collected in the course of the feeding trial and the result showed non-significance ($P>0.05$) in feed intake (68.11-75.66 g/rabbit/day), body weight gain (5.39-8.40 g/rabbit/day), feed conversion ratio (6.64-7.82) and protein efficiency ratio (11.59-13.38); others parameter included feed cost per kg and mortality. Blood samples were collected from 2 rabbits per treatment for haematological parameters; the results obtained showed that there was no variation ($P>0.05$) in PCV (26.25-34.00 %), Hb (9.30-10.10 g/dl), RBC (2.23-2.93 $X10^{12}$) and WBC (6.00-7.75 $X10^{7}$). MCV, MCH, MCHC, neutrophils and leucocytes were also not affected by the graded levels of TNO. The inclusion of TNO in the diet of rabbits did not affect their health status as well as growth rate therefore; farmers can incorporate up to 20% of TNO in the diets of rabbits without causing any deleterious effect.*

**Keywords:** Weaner rabbits, haematology, growth rate, Tiger nut offal

## Introduction

Animal protein is a very important requirement in human diet, for the supply of all needed essentials amino acids that the body cannot synthesize. In Nigeria, like many other developing countries of the world, there is inadequate dietary animal protein in terms of quality and quantity. This is contrary to the situation in many developed countries that have well developed animal production industries that meet the demand for dietary animal supply; larger percentage of human population live on cereals and not root crops which are deficient in essential amino acid needed for growth and development. Tewe (1997) reported that animal protein consumption in Nigeria was 4.82g/caput/day as against the required minimum of 35g recommended by the FAO (2002).

The challenge therefore, is that of searching and researching on the less conventional energy feedingstuffs that could alleviate the high cost of feeding the animals which is known to be over 75% of total cost of production. Tiger nut being of the non-conventional feedingstuffs is a noxious, invasive and injurious weed in the tropical and temperate zones; it is an edible tuber with a slightly sweet, nutty flavor. The nut have excellent nutritional qualities with a fat composition similar to olive oil and is also very rich in mineral content especially phosphorus and potassium (Eteshola and Oraedu, 1996) which makes it a suitable ingredient for feeding monogastric animals. The objective of the study is therefore to investigate the growth rate and haematological response of weaner rabbits fed graded levels of TNO meal-based diets.

## Materials and Methods

*Study area*

The experiment was carried out at the Research and Teaching Farm of the Faculty of Agriculture, Nasarawa State University, Keffi, - Shabu Campus. It is located in the Guinea Savanna Zone of North Central Nigeria. It is found in Latitude 08°35'N Longitude 08°33'E. The mean monthly maximum and minimum temperatures were 35.06° and 20.16°, respectively at the time of the experiment while the mean monthly relative humidity and rainfalls were 74.67% and 168.90mm, respectively (NIMET, 2008).

*Source of Tiger nut offal*

Tiger nut offal (TNO) was sourced from local drink vendors within Lafia metropolis, Nasarawa State, Nigeria. It was sun-dried and used to compound the experimental diets.

**Table 1:** Proximate composition and energy value of *Cyperus esculentus* offal

| Nutrients | (%) |
|---|---|
| Caloric value (ME, kcal/kg) | 522.6 |
| Crude protein | 8.50 |
| Crude fibre | 5.50 |
| Ether extract | 2.12 |
| Moisture (%wet.wt) | 6.77 |
| Total Carbohydrate | 65.50 |
| Total Ash | 1.86 |
| NFE | 64.00 |

***Management of the rabbits and experimental design***

Twenty weaner rabbits of mix sexes with age ranging from 4 to 6 weeks were randomly allotted to 5 treatment groups and replicated 4 times. Each replicate had 1 rabbit that was housed individually in a cage. The rabbits were fed twice daily (7.00am and 4.00pm) and had access to drinking water at all times. Feeding troughs and drinkers were provided in each cage and known quantity of feed was supplied daily. The experiment lasted for a period of 35 days after an initial adjustment period of 7 days.

**Table2:** Percent gross composition of weaner rabbits

| Ingredients | $T_1$ (0%) | $T_2$ (5%) | $T_3$ (10%) | $T_4$ (15%) | $T_5$ (20%) |
|---|---|---|---|---|---|
| TNO | 0% | 5% | 10% | 15% | 20% |
| Premix | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| NaCl | 1.00 | 0.25 | 0.25 | 0.25 | 0.25 |
| Bone ash | 1.35 | 1.50 | 1.00 | 1.00 | 1.00 |
| Palm oil | 2.00 | 4.00 | 4.00 | 4.00 | 5.00 |
| Methionine | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Lysine | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| GNC | 22.00 | 14.50 | 13.65 | 17.50 | 18.00 |
| Rice offal | 29.90 | 16.00 | 14.00 | 7.00 | - |
| Maize bran | - | 20.50 | 15.00 | 5.00 | 2.00 |
| FFSB | 8.00 | 12.50 | 16.00 | 15.00 | 17.00 |
| Maize | 35.00 | 25.00 | 25.35 | 34.50 | 36.00 |
| Total | 100 | 100 | 100 | 100 | 100 |
| Energy (kcal/kg, ME) | 2795.74 | 2779.93 | 2710.60 | 2706.59 | 2711.12 |
| CP (%) | 18.46 | 18.02 | 18.08 | 18.15 | 18.00 |
| CF (%) | 5 84 | 5.92 | 5.26 | 3.71 | 2.72 |
| Ca (%) | 0.21 | 0.88 | 0.70 | 0.70 | 0.77 |
| P (%) | 0.83 | 0.52 | 0.50 | 0.42 | 0.31 |

*Premix, the vitamins and mineral premix supplied the following per 100kg of diet. Vitamin A 15,000 I.U, vitamin $D_3$ 300,000 I.U ,vitamin E 3,00 I.U, vitamin K 2.50mg, thiamin,($B_1$) 200mg, riboflavin ($B_2$) 600mg, pyridoxine ($B_6$) 600mg, niacin 4 0.0mg, vitamin $B_{12}$ 2mg, panthothenic acid 10.0mg, folic acid 100mg, biotin 8mg, choline chloride 50g, antioxidant 12.5g, manganese 96g, zinc 6g, iron 24g, copper 0.6g, iodine 0.14g, selenium 24mg, cobalt 214mg. TNO - Tiger nut offal, GNC - Ground nut cake

*Chemical analyses*

The proximate analysis of TNO (Table 1) was done at Biochemistry Laboratory of the Department of Animal Science, Faculty of Agriculture, Nasarawa State University, Keffi using the procedure outlined by AOAC (1990). Nitrogen free extract (NFE) was calculated using the formula: NFE (%) =100-(%CP+%CF+%EF+%ASH+Moisture).

*Experimental diets*

Five iso-nitrogenous (about 18% CP) and iso-caloric (2700 kcal/kg, ME) diets (Table 2) were compounded to contain 0, 5, 10, 15 and 20 % levels of TNO in treatments $T_1$, $T_2$, $T_3$, $T_4$ and $T_5$, respectively such that $T_1$ served as the control diet.

*Data collection*

Performance data were collection in the course of the feeding trial which included feed intake, body weight gain, feed conversion ratio, protein efficiency ratio, feed cost per kg and mortality.

At the end of the 35th day 2 rabbits per treatments were randomly selected, a 2 *ml* sterilized disposable syringe and needle was used to collect blood sample from the heart according to the methods outlined by Schalm *et al.* (1972). The blood were emptied into sample bottles containing EDTA to prevent clotting and used for the hematological analysis. The parameters analyzed included packed cell volume, red blood cell, white blood cell, hemoglobin, mean cell haemoglobin, mean cell haemoglobin concentration and mean cell volume.

*Statistical analysis*

Data obtained were subjected to One Way Analysis of Variance (ANOVA) and where significance differences ($P<0.05$) were observed, means were separated using Least Significance Difference (LSD) as describe by (Aeangwanich *et al.*, 2004).

**Results and Discussion**

There was no significant variation ($P>0.05$) in feed intake (68.11-75.66 g/rabbit/day), body weight gain (5.39-8.40 g/rabbit/day), feed conversion ratio (6.64-7.82) and protein efficiency ratio (11.59-13.38) of weaner rabbits (Table 3); the non-significant difference recorded could be attributed to the nutritional adequacy and safety of the test ingredients. The values recorded in this study fell within the normal ranges for rabbits as earlier reported by Lebas (1980) and Dalikeh *et al.* (2012). Dalikeh *et al.* (2012) reported lower values of 40.22 to 44.60g/rabbit/d for feed intake as compared to the ones recorded in the present study. The values recorded for haematological parameters were not significantly affected ($P>0.05$) by different dietary treatments (Table 4). PCV (26.25-34.00 %), Hb (9.30-10.10 *g/dl*), RBC (2.23-2.93 $X10^{12}$) and WBC (6.00-7.75 $X10^{7}$) and other haematological variables evaluated were affected by the various levels of inclusion of TNO in the diets. The non significant difference suggests the wellness of the animals throughout the period of the experiment as normal haematological parameters of an animal are direct indication of absence of disease (Olafedehan, 2010).

**Table3:** Effect of graded levels of TNO meal-based diets on growth parameters of weaner rabbits

| Parameters | T1 (0%) | T2 (5%) | T3 (10%) | T4 (15%) | T5 (20%) | SEM | LOS |
|---|---|---|---|---|---|---|---|
| Initial weight (g/rabbit) | 725.00 | 775.00 | 787.50 | 787.50 | 775.00 | 57.19 | NS |
| Final weight (g/rabbit) | 1087.48 | 1001.12 | 1089.33 | 1108.19 | 1109.23 | 69.78 | NS |
| Weight gain (g/rabbit/d) | 8.48 | 5.39 | 7.07 | 7.65 | 7.95 | 0.34 | NS |
| Feed intake (g/rabbit/d) | 69.44 | 70.77 | 68.11 | 75.66 | 72.08 | 1.29 | NS |
| Feed conversion ratio | 6.64 | 7.09 | 7.60 | 7.82 | 6.84 | 0.69 | NS |
| Protein efficiency ratio | 12.59 | 12.72 | 13.38 | 12.61 | 11.59 | 1.22 | NS |
| Feed cost/kg (N/kg) | 104.63 | 99.70 | 85.91 | 76.36 | 70.24 | - | - |
| Mortality (%) | 0 | 25 | 0 | 0 | 50 | - | - |

SEM-Standard Error of Mean NS- Not Significantly different ($P>0.05$), LOS-Level of significance

**Conclusion and Recommendation**

From the results of this study farmers can use up to 20% of TNO as a source of energy for rabbit feeding without affecting their health and growth.

Table 4: Effects of graded levels of TNO meal -based diets on the haematological parameters of weaner rabbits.

| Parameters | $T_1$ (0%) | $T_2$ (5%) | $T_3$ (10%) | $T_4$ (15%) | $T_5$ (20%) | SEM | LOS |
|---|---|---|---|---|---|---|---|
| PCV *(%)* | 29.50 | 29.50 | 30.50 | 26.25 | 44.00 | 5.65 | NS |
| Hb *(g/dl)* | 9.95 | 10.10 | 9.95 | 9.30 | 10.05 | 3.14 | NS |
| RBC *($X10^{12}$)* | 2.91 | 2.93 | 2.75 | 2.23 | 2.91 | 1.66 | NS |
| MCV *(fl)* | 100.20 | 100.85 | 111.20 | 104.15 | 100.60 | 10.18 | NS |
| WBC *($X10^{7}$)* | 7.25 | 6.00 | 7.05 | 7.75 | 6.35 | 2.62 | NS |
| MCH *(p/g)* | 33.75 | 34.20 | 35.35 | 35.95 | 34.45 | 5.89 | NS |
| MCHC *(g/dl)* | 33.75 | 34.20 | 31.90 | 35.25 | 34.00 | 5.82 | NS |
| Lymphocyte *(%)* | 60.50 | 63.00 | 55.50 | 55.75 | 63.00 | 7.72 | NS |
| Neutrophils *(%)* | 39.50 | 37.00 | 44.50 | 43.00 | 37.00 | 6.34 | NS |

SEM= standard error of mean, LOS= level of significant, NS= not significant (P>0.05), LOS-Level of significance, PVC- Packed cell volume, Hb- Haemoglobin, RBC- Red blood cells, MCV- Mean corpuscular volume, WBC- White blood cells, MCH- Mean corpuscular haemoglobin, MCHC- Mean corpuscular haemoglobin concentration

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