Performance and Haematological Parameters of Growing Rabbits Fed with Noodle Waste as a Partial Replacement for Maize

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Abstract— *The aim of this study was to evaluate the effect of noodle waste on the performance as well as haematological parameters of growing rabbits. Twenty four growing rabbits of the dutch breed were used for this experiment. The rabbits were alloted four dietary treatments T1, T2, T3 and T4 containing 0%, 10%, 20% and 30% noodle waste respectively. The experiment lasted for a period of 8 weeks and the data obtained were statistically analysed. The result showed that the average weight gain and feed conversion ratio (FCR) of the rabbits were significantly affected (P<0.05) by the experimental diet. The average feed intake ranged from 0.29kg/animal in treatment 1 to 0.36kg/animal in treatment 4 while the average live weight ranged from 1.29kg/animal in treatment 1 to 1.32kg/animal in treatment 4. The result also showed significant difference (P<0.O5) in the Packed Cell Volume, White Blood Cells, Red Blood Cells, Haemoglobin, Neutrophils, Eosinophils, Lymphocytes and Monocytes. This study also showed that platelets values obtained from the result of this experiment showed no significant difference (P<0.05) across the various treatment groups. Noodle Waste can be incorporated up to 30% in the feed without having any deleterious effect but beneficial effect on performance and haematological parameters of the rabbits.*

Keywords— Performance; Haematology; Noodle Waste.

I. INTRODUCTION

It has been established that in many developing countries of the world, the reason for the decrease in consumption of animal proteins is the insufficient consumption of traditional livestock - cattle, sheep, goats, pigs and chickens. (1) approximately 854 million people, representing 12.6% of the world's population, are severely malnourished. To solve this, (2) argued that non-traditional meat sources suitable for smallholders need to be explored.

Rabbits have high reproductive potential and a unique ability to act as a flexible financial reserve. In particular, rabbit breeding in Nigeria offers the greatest potential to increase the quality and quantity of protein intake due to the short generation interval (4). Maize (*Zea mays*) is the main source of energy for feeding livestock in Nigeria, but it is also needed by humans and processing industries (5) The demand for maize in Nigeria has increased and this has led to a great hike in price of livestock feed; therefore, concrete efforts are needed to find alternative, inexpensive sources of nutritional ingredients with little or no competition with human consumption (5). In recent years, agro-industrial waste products have become popular feed components in poultry diets in Nigeria (6), (7). Examples of such products are kitchen waste, canning industry waste, potato pulp waste, citrus fruit waste, bakery waste, kola nut flour, cocoa bean flour, pigeon pea flour, Bambara groundnut flour, cashew flour, etc.

Since its introduction in the Nigerian kitchen, instant noodles have become popular, well accepted and found in the kitchen of almost every Nigerian home (8). This caused a big boom of the industry and a corresponding amount of waste in the industry. Instant noodles have several advantages over other non-conventional noodles. Instant noodles are intended for human consumption, therefore they are hygienically packaged and this eliminates the fear of contamination. Instant noodle waste has no known anti-nutritional factors (9) and also has more metabolizable energy than maize (10). The density composition of noodle waste (NW) has been reported to be comparable to that of maize (10). Noodle waste is a suitable source of energy, it

does not directly compete with humans as food source, it does not need further processing before being incorporated into the diet and its price is stable and favorable compared to maize.

In most developing countries, such as Nigeria, animal protein consumption has fallen below (11) the recommended 35g per animal per day. The apparent reason for the anomaly is the sharp rise in the prices of meat and other animal products such as milk and eggs, which have become unaffordable for the common man. This culminated in various malnutrition diseases such as kwashiorkor, beriberi, marasmus and many others in babies and children, not only in rural areas but also in big cities (12). For this, it is urgently necessary to promote the production of small and highly productive livestock, such as rabbits, whose turnover is fast. Very low production costs. However, the high cost of energy and protein foods such as maize and soybeans and the intense competition between humans and livestock for these foods is a concern. Therefore, replacing maize with agricultural by-products in poultry rations significantly reduces production costs (13). With increasing demand for maize and maize products (14), this has encouraged research into the use of alternative and cheaper feed resources, especially agro-industrial by-products and waste, to replace maize in livestock feed, reduce feed costs and thus reduce total cost of production (15). It can be argued that feed costs can be minimized by using cheaper, non-traditional feed ingredients such as noodle waste. The aim of this study is therefore to determine the performance characteristics and hematological parameters of rabbits fed different quantities of instant noodle waste flour as a partial substitute for maize.

II. MATERIALS AND METHODS

2.1 Experimental site and duration

The experiment was conducted at the Rabbits Unit of the University of Port Harcourt Teaching and Research Farm, Choba, Rivers State, Nigeria. The campus is situated at Choba, off east-west road, Port Harcourt and is at latitude 4.89437°N, longitude 6.91053°E and 16m altitude, having an average temperature of 28°Celsius (82.40°F). The experiment lasted for a period of eight (8) weeks.

2.2 Experimental design

Twenty four (24) Dutch rabbits were used for the experiment in a completely randomized design (CRD). The rabbits were assigned to four (4) dietary treatments and each treatment group was replicated three times with a total number of two (2) rabbits per replicate. The four (4) treatments were designated as T1, T2, T3 and T4.

2.3 Experimental Animals and Management

A concentrate diet was formulated to meet the nutrient requirement of the rabbit. Twenty four (24) grower rabbits used for the experiment were purchased from Michael Okpara University of Agriculture Teaching and Research Farm in Abia State.

The rabbits were allowed to acclimatize to the new environment for a period of one week, and thereafter, the live weight differences between treatment groups were obtained. Individual rabbits were given feed and fresh water ad-libitum. Noodle waste was used to substitute maize at graded levels. Measured quantity of each ingredient in the different diets was taken and properly mixed together. The diets formulated were isonitrogenous and isocaloric. The control (T1) had maize but no noodle waste, while T2, T3 and T4 had 10%. 20% and 30% of noodles waste as replacement for maize in T2, T3 and T4 respectively.

2.4 Data Collection:

2.4.1 Performance Parameters:

The animals' initial weight was measured and recorded, thereafter, they were weighed at weekly intervals using a Camry sensitive electronic scale to determine their weekly weight gain. The rabbits were weighed at the end of the experiment, and the average weight gain was calculated by subtracting the initial weight from the final weight. The daily feed intake was calculated by subtracting the leftover feed from the initially offered feed. The feed conversion ratio was determined by dividing the average daily feed intake per rabbit by the average daily weight increase per rabbit over the study period.

2.4.2 Haematological Parameters:

At the end of the experiment, blood samples were collected from two rabbits per treatment using (3ml) disposable syringe and were transferred directly into dry sample bottles containing Ethylene Diamine Tetracetic Acid (EDTA) anticoagulant for haematological parameters which included; Packed Cell Volume (PCV), Haemoglobin (HB), Red Blood Cell (RBC), White Blood Cell (WBC), Platelets, Eosinophils, Neutrophils, Monocytes and Lymphocytes values.

2.5 Statistical Analysis

Data generated were subjected to analysis of variance (ANOVA) using SAS (2000) Statistical Software. Significant ($p<0.05$) differences were separated using Duncan New Multiple Range Test.

III. RESULTS

The effect of the dietary treatments on the performance parameters of Rabbits is presented in Table 3. The result obtained showed that the average weight gain and feed conversion ratio (FCR) of the rabbits were significantly ($P<0.05$) affected by the experimental diet. T2 and T4 had the best ($p<0.05$) Average Weight Gain and Feed Conversion Ratio of 0.39/animal and 1.9 respectively. The result obtained also showed no significant difference ($P>0.05$) in the average feed intake and average live weight. The average feed intake ranged from 0.29kg/animal in T1 to 0.36kg/animal in T4 while the average live weight ranged from 1.29kg/animal in T1 to 1.32kg/animal in T4.

From the result of the haematological analysis in presented in Table 4, the packed cell volume (PCV), white blood cells, red blood cells, Haemoglobin, Neutrophils, Eosinophils, lymphocytes and monocytes were all significantly ($P<0.05$) influenced by the experimental diet. The packed cell volume, haemoglobin, red blood cells and monocytes were highest ($p<0.05$) in T2, having values of 39.00, 13.00, 5.90 and 8.00 respectively. The white blood cells and Lymphocytes were highest ($p<0.05$) in T4, having values of 9.00 and 56.33 respectively. Neutrophils were observed to be significantly ($P<0.05$) higher in T3 (45.33%), T2 (40.00%) and T4 (38.33%) over the control treatment. Eosinophils obtained were significantly ($P<0.05$) highest in T1 (4.6%) and lowest in T4 (2.33%). Platelets values obtained from the result of the experiment showed no significant difference ($P>0.05$) across the various treatment groups.

TABLE 1
COMPOSITION OF THE DIETARY TREATMENTS

Ingredients	T1 (0% NW)	T2 (10% NW)	T3 (20% NW)	T4 (30% NW)
Yellow maize	48.00	42.09	36.09	30.09
Indomie waste	0.00	6.00	12.00	18.00
Wheat bran	10.75	10.75	10.75	10.75
PKC	12.42	12.42	12.42	12.42
Soybean Meal	12.0	12.0	12.0	12.0
GNC	8.48	8.48	8.48	8.48
Bone meal	4.5	4.5	4.5	4.5
Salt	0.13	0.13	0.13	0.13
Methionine	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Vit/min premix	3.13	3.13	3.13	3.13
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**

TABLE 2
PROXIMATE COMPOSITION OF THE EXPERIMENTAL DIETS

Feed Ingredients (%)	T1 (0% NW)	T2 (10% NW)	T3 (20% NW)	T4 (30% NW)	SEM
Crude protein	14.90^{d}	11.84^{c}	22.34^{b}	25.41^{a}	0.01
Dry matter	83.53^{d}	88.53^{a}	87.40^{c}	88.21^{b}	0.02
Crude fat	4.63^{a}	1.83^{c}	3.93^{b}	3.93^{b}	0.02
Ash	8.23^{a}	5.33^{b}	5.13^{c}	4.63^{d}	0.02
Crude fibre	7.10^{a}	2.14^{c}	7.00^{a}	4.65^{b}	0.02
NFE	48.68^{d}	67.41^{a}	54.02^{b}	49.61^{c}	0.07

TABLE 3
EFFECT OF NOODLE WASTE ON PERFORMANCE OF RABBITS

Performance parameters	T1 (0% NW)	T2 (10% NW)	T3 (20% NW)	T4 (30% NW)
Average feed Intake (Kg)	0.29 ± 0.04	0.34 ± 0.05	0.35 ± 0.06	0.36 ± 0.05
Average Weight gain (kg)	0.13^{b} ± 0.05	0.39^{a} ± 0.09	0.31^{ab} ± 0.09	0.22^{ab} ± 0.08
Average Live weight (kg)	1.29 ± 0.45	1.63 ± 0.34	1.30 ± 0.28	1.32 ± 0.31
Feed Conversion Ratio	3.21^{b} ± 0.07	2.42^{ab} ± 0.17	2.33^{ab} ± 0.16	1.9^{a} ± 0.12

means in a row with no superscript are not significantly different (P>0.05).

TABLE 4
EFFECT OF NOODLE WASTE ON HAEMATOLOGICAL PARAMETERS OF RABBITS

Haematological parameters	T1 (0% NW)	T2 (10% NW)	T3 (20% NW)	T4 (30% NW)
PCV (L/L)	29.00^{ab} ± 1.53	39.00^{a} ± 0.58	30.00^{ab} ± 2.65	28.67^{ab} ± 4.2
Haemoglobin (g/dL)	9.50^{ab} ± 0.76	13.00^{a} ± 0.17	10.07^{ab} ± 0.47	9.67^{ab} ± 0.88
Red blood cells (10^{6}/µL)	4.37^{ab} ± 0.18	5.90^{a} ± 0.12	4.37^{ab} ± 0.27	4.20^{ab} ± 0.21
White blood cells (10^{3}/µl)	6.87^{b} ± 0.88	7.03^{ab} ± 0.15	7.15^{ab} ± 0.12	9.00^{a} ± 0.67
Platelets (10^{3}/µl)	182.33 ± 4.33	179.67 ± 11.20	195.00 ± 7.69	203 ± 11.02
Neutrophils (10^{3}/µl)	35.00^{b} ± 2.89	40.00^{ab} ± 1.16	45.33^{a} ± 0.88	38.33^{ab} ± 0.88
Lymphocytes (10^{3}/µl)	51.33^{ab} ± 2.19	47.00^{b} ± 2.52	46.05^{b} ± 3.06	56.33^{a} ± 2.33
Eosinophils (10^{3}/µl)	4.6^{a} ± 0.88	3.60^{ab} ± 0.38	2.33^{b} ± 0.33	2.33^{b} ± 0.33
Monocytes (10^{3}/µl)	7.33^{a} ± 1.45	8.00^{ab} ± 0.10	6.67^{ab} ± 1.67	3.37^{b} ± 0.67

^{abc}, means on the same rows having different superscript differ significantly (P<0.05)

IV. DISCUSSION

The effect of dietary treatment on the performance parameters of broilers showed a significant difference in the average weight gain and feed conversion ratio (FCR) of rabbits. This result is consistent with the findings of (16), who reported a significant difference in performance parameters of albino rats fed noodle waste as part of their diet. This result is also consistent with (17) who noted a significant difference in the performance parameters of chickens fed the NW diet. The significant increase in average weight of rabbits in the treatment groups indicates a direct relationship between weight and dietary NW levels, which is consistent with the findings of (9). However, this result is in contrast to the findings of (18), which reported no significant difference in the feed conversion ratio of birds fed graded levels of instant noodle waste. The superior performance of rabbits fed diets containing 10, 20 and 30% noodle waste compared to the control diet may be due to the low crude fiber content and nutritional factors, as well as the palatability of the food, which increases feed intake and therefore body weight gain in animals (19). Also, the obtained result showed no significant difference in terms of average feed consumption and average live weight. This result is consistent with the findings of (18) who reported no significant difference between average feed consumption, average live weight and other performance parameters in birds given graded levels of noodle waste in their diet. However, the highest mean feed intake was observed in T4, while the lowest value was obtained in the control treatment. The higher feed intake observed in T4 is consistent with the findings of (19) and (9) who reported increased feed intake with increased noodle waste in animal diets. The result also showed that the feed utilization of rabbits was better in T4 as indicated by the calculated feed conversion ratio. The addition of noodle waste flour to the diet of rabbits had a significant effect on hemoglobin, red blood cell count, white blood cells, neutrophils, lymphocytes, eosinophils and monocytes in rabbits. This result is consistent with the findings of (20), who found a significant difference in the blood profile of birds fed graded levels of noodle waste in their diets.

(16) also reported a significant influence in hemoglobin and packed cell volume values in albino rats fed a noodle-based diet. The high hemoglobin values obtained in T2 show that the oxygen capacity of the rabbit blood with hemoglobin was relatively the best. It has also been found that an animal with reduced hemoglobin in its blood indicates poor nutrition, including iron, amino acid and vitamin deficiencies (21). The white blood cell count of this study showed a significant increase during treatment. The increase in white blood cell count as the amount of noodle meal in the diet increased is consistent with the findings of (20), who reported a significant increase in total white blood cell count in birds fed graded levels of noodle waste. White blood cells and their varying numbers play an important role in protecting the body against disease-causing bacteria, viruses and fungi, a lack of white blood cells can increase susceptibility to infection. A decrease in white blood cells reflects a decrease in the production of white blood cells to protect the body against infections (18). Packed cell volume is the volume of red blood cells per liter of blood. Its measurement gives the percentage of red blood cells in whole blood (19). The high PCV values recorded in T2 are significant due to the role of red blood cells and hemoglobin in the transfer of respiratory gases (16). This report is in contrast with the findings of (18), who reported no significant differences in hemoglobin, erythrocytes, white blood cells, and other hematological parameters in birds fed noodle waste classified as poultry diet. This study revealed that blood platelet values were not significantly influenced by the dietary treatment which is in agreement with (18).

V. CONCLUSION AND APPLICATIONS

The study revealed that:

1. The inclusion of 10-30% of Noodle waste in the diets of the rabbits did not have any deleterious effect on the haematological status of the rabbits but was rather beneficial to the overall performance of the rabbits.
2. The findings therefore suggest that noodle waste could partially replace maize to enhance their performance and haematological parameters.

REFERENCES

[1] Food and Agricultural Organization (2006). Bulletin \ (8th Edition). Rome.

[2] Biobaku, W.O. and Ekpeyong, T.E., (2001). Effects of feeding graded level of water lettuce and water hyacinth on the growth of rabbit. *Journal Application Rabbit Respondings.*, 14, 98– 100.

[3] Iheukwumere, F.C. and Okoli, I.C. (2002). Preliminary studies on raw Napoleona Imperialis as feed ingredient. 1: performance and blood chemistry of weaner rabbits. *Tropical Animal Production Investigation.* 6, 113 – 119.

[4] Effiong, O.O. and Wogar, G. S., (2007). Litter performance traits of rabbit under mixed feeding regime. *Proc. 32nd Annual conference of the Nigeria society for Animals production.* Calabar, March 18 – 21, 2007, pp. 155 – 158.

[5] Ukachukwu, S. N., (2005). Studies on the nutritive value of composite cassava pellets for poultry: chemical composition and Metabolizable energy. *Livestock Research for Development.* 17 (11).

[6] Eustace, (2005). Effect of Enzyme supplementation on palm kernel meal and brewers dried grain on the performance of broilers. *International. Journal of Poultry Science.* 4 (2): 76-80.

[7] Adeyina, A. O., Annongu, A. A. and Awe, O., (2008). Effects of cocoa bean shell on the performance, blood indices and organ characteristics of cockerels. *Agrosearch*. 10 (1). Pp: 11 – 19.

[8] Business news, (2006). "The Noodles War | The NEWS – Nigeria's authoritative weekly newsmagazine "Thenewsng.com.2008-07-21.

[9] Eniolorunda, O.O., Taiwo, B. B. A., Oyewumi, O.O. and Adeyemi, O.A., (2008). Performance of laying hens fed graded levels of indomie waste as replacement for maize in humid Tropical environment. *Research Journal of Animal Sciences.* 2 (5): 135-138.

[10] Laila, A, O., Bamgbose, M. D., Eruvbentine M., Bemji, A.O. and Osundare,T.O. (2010): Effects of Instant noodles waste based diets as a replacement for maize on Haemotological parameters of broiler chickens. *Proceeding of 15th Annual Conference of Animal Science Association of Nigeria.*(ASAN). 5-7.

[11] Food and Agricultural Organisation/World Health Organisation/United Nations University, (1985). Energy and protein requirements. Report of a Joint Expert Consultation. World Health Organization Technical Report Series. 724: 1 – 206.

[12] Onyimonyi, A. E. and ENE, J. C., (2003). Performance of growing rabbits fed Panicum maximum with graded levels of a concentrate diet. Pages 73 – 75. In: Olatunji, E. A., Ayanwale, B. A., Shiawoya, E. L. And Aremu, A. (Eds.). Sustainable Livestock Productivity and National Development the Holistic Approach. *Proceedings of the 8thAnnual Conference of Animal Science Association of Nigeria* (ASAN), September 16 – 18, 2003, Federal University of Technology, Minna, Niger State, Nigeria.

[13] Adejumo, D. O., Onifade, A. A., Olutunde, T. O. and Babatune, G. M. (2005). The effect of concentration, age and duration of feeding supplemental yeast (Levueisb®) in high fibre diet on the performance of broiler chicken. Pages 69 – 76. In: The Proceedings of the First Nigeria International Poultry Summit, held at The Temperance, Ota, Ogun State, Nigeria.

[14] Ukachukwu, S. N., (2005). Studies on the nutritive value of composite cassava pellets for poultry: chemical composition and Metabolizable energy. Livestock Research for Development. 17 (11).

[15] Fasuyi, A.and Olumuyiwa,T.A., (2012). Evaluating Nutritional Potential of Bio-fermented Rice Husk in Broilers Diets. American Journal of Food Technology. 7(12): 726-735.

[16] Zailani, H. A., Umaru, H. A. and Samuel, G., (2016). Effects of Instant Noodles Formulated Diet on Weanling Albino Rats. Direct Resource Journal of Agriculture and Food Science. 4 (7): 161-168.

[17] Omole, A.J., Obi O. O., Adejinmi, O.O. and Ajasin, F.O. and J. A. Fayenuwo, J.A., (2013). Performance Characteristics and Economy of Using Noodle Waste as Replacement in the Diets of Weaner Rabbits. *American Journal of Experimental Agriculture.* 3(4): 1044-1051.

[18] Animashahun R. A, Omoikhoje S. O, Alabi, O.O, Shoyombo, A.JandOlawoye S.O, (2018). Influence Of Graded Levels Of Instant Noodle Waste In The Diets On The Performance, Carcass Traits And Haematology Of Broiler Chickens. Agrosearch. 18(1): 40–52.

[19] Orogun, A.J., (2014). Growth Response and Haematological Characteristics of Broiler Chickens Fed Diets Containing Shea Butter (VitellariaParadoxa C.F Gaertn) Seed Cake As Starter Diet. Department of Biological Sciences, Ahmadu Bello University, Zaria, Nigeria.

[20] Alabi, O.M., Aderemi, F.A., Ladokun, A.O., (2012). Blood Profile of Birds fed Graded Levels of Noodles Waste Meal. *Elixir International Journal.* 4 (5): 32-35.

[21] Afolabi, O. and Oladimeji, H. (2003). Haematological studies of some avian species. *International Journal of Poultry Science.* 30 (2): 24.