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Zoo-technical performances of weaner rabbits fed Nutryzyme® supplemented diets

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***Abstract*— *The study assessed the zoo-technical performances of weaner rabbits fed Nutrizyme supplement diets. This study aimed at determining the zoo-technical performances of the weaner rabbits fed Nutrizyme supplement diets while we specifically determined the zoo-technical performances, the apparent nutrient digestibility as well as the hematological and serum Biochemical of weaner rabbits fed Nutrizyme supplement diets. Eighteen rabbits were allotted into three dietary treatments with each having three replicates in a completely randomized design format. Each replicate (unit) housed two rabbits. The Nutrizyme powder was incorporated in the diets at 0, 125, and 250 ppm respectively. The parameters appraised include average daily feed intake, feed efficiency, average final weight and the heamatological and serum profiles. All data generated were subjected to analysis of variance using statistical packages for social sciences (SSPM) packages. There were significant ($p<0.05$) differences in the total weight, average daily weight, average daily feed intake as well as the feed efficiency. Rabbits fed diets 3 (250mg/kg Nutrizyme inclusion) had the best result in terms of the total weight (1068g), average daily (0.25), respectively. There were significant ($p<0.05$) differences in the digestibility of nutrients among the rabbits as indicated in the results. The crude protein digestibility improved with increased enzyme inclusion in the diets. Rabbits fed the control diet had the least nutrient digestibility. The heamoglobin concentrations, white blood cells and serum metabolites were not significantly influenced ($p<0.05$) by dietary treatments. The packed cell volumes (PCV) of 36.03 to 41.06% were within the normal values of 35 to 45%, also red blood cell counts and the mean cell heamoglobin concentration (MCHC), were within the range reported for rabbits. Enzyme was found to be good nutrient metabolite that could enhance the growth of weaned rabbits. The already established quantity (125g/ton of feed) should be maintain as either increase or decrease in the internationally recommended quantity did not significantly ($p<0.05$) affect the zoo-technical performances nutrient digestibility, heamatological and serum metabolites of weaner rabbits.*

Keywords*— *Rabbit, Nutrizyme®, Enzymes, performances.

I. INTRODUCTION

Currently, the advance of modern biotechnology, application of naturally occurring antimicrobial and antioxidant compounds have been preferably employed in meats because of their potential health benefits and physiology of the host, modulation of the gut flora due to their antimicrobial activity; moreover, they do not leave residual in meat and other products.

Rabbit meat is high in protein and low in fat, cholesterol, sodium and calories (Fielding, 2003). Rabbit is reared purposely to achieve protein self-sufficiency for the home, also reared mainly for its economic importance because it`s a good and cheap alternative sources of protein. In large and small scale farming, it has low cost of production, they can survive on high fiber feedstuffs like ruminant and concentrate like monogastric animals, they are pseudo-ruminants. The meat is generally acceptable because no religion nor taboo is against it, the meat contains (16-18%) protein, energy (1749 kcal/g) and low fat content (10-11%) than other meats. Rabbits are very prolific with short gestation period of 28-32 days.

There is also need to move from self-sufficiency of meat consumption to cash income as the motive for production or the expansion is to succeed. It has been reported that the feeding cost of rabbit is minimal, and also the rabbits requires less space, make less noise and produces minimum

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odour, so it is a good livestock for backyard farming (Abdumalik, 1994).

Nutrizyme is a product of bacteria endo -1, -4-B-xylase; IBU 3.2.1.9. They are found in fruits, meats and vegetables and actually help to digest foods when eaten them. Cooking destroys many enzymes due to heat. Metabolic enzymes are another type of enzymes needed by the body and they are contained in organs and glands. These enzymes are sent out when to perform a function. Enzymes are the precursors to all life activities and keep everything functioning. They are the protein that gives all life a jumpstart.

Nutrizyme utilizes specific enzymes that affect the stomach, liver, kidney, pancreas, spleen and duodenum. These are the vital organs of the body that detoxify and energize the system.

A nutrease enzyme increases the digestibility of carbohydrates in natural ingredients. A high quality nutrease enhances digestibility in all types of ingredients, not only soya bean meal, and works on all the majority of carbohydrate that make up such ingredients (both structural and storage carbohydrates). These pro-biotic microorganisms are sporulated or non-sporulated bacteria, yeast or mould, with active substances having a beneficial effect for human health (Connolly, 2010). Renewed interest in the use of pro-biotic microorganisms came in 2006 when the European Union banned the use of anti-microbial growth promoters.

Pro-biotic are administered as feed supplements in other to improve the intestinal balance, which most of the time is reflected in a better performance of rabbits (feed conversion and weight gain) and at the same time colonization of pathogenic bacteria, such as salmonella species and to a lesser extent campylobacter, is prevented (Patrick, 2008). Enzymes jumpstart the glands and organs of digestion, assimilation, immunization and eliminate by awakening the organs and serve as catalyst to start their important functions, it wakeup the lethargic organ, vitalize them and put them to work fast to perform their parts in nourishment of the body. Its function as an optimal zoo-technical agent. Nutritional enzymes are a form of help to the body sometimes called organ therapy or organ therapy.

Cereals such as wheat, maize etc. contain long, complex carbohydrate molecules known as non-starch polysaccharides (NSPs) for which animals such as rabbits do not produce the necessary digestive enzymes. The major NSPs in wheat are called carbohydrates and those in barley are beta-glucans. It is now well recognized that these components are anti-nutritional in behavior. Not only do they increase the viscosity of digester, which means, that the animal`s own enzymes, have a harder time locking onto nutrients and the absorption of these nutrients is reduced, but they also encapsulate nutrients, thereby making them unavailable to the animal. The addition of Nutrizyme enzymes to animal diets allows the breakdown of these anti-nutritional factors and thus, increase the rate of digestion of the feed, leading to improved nutritive value. Nutrizymes are also able to upgrade source of vegetable protein (such as soybeans, rapeseed, sunflower, seed legumes) in rabbits, pigs and poultry diets.

Summer *et al*., (2009) adduced some importance of the nutrizyme such as reduction of fed costs by providing flexibility in feed efficiency in feed formulated, improvement of uniformity, improvement of litter quality, an increase in the dietary content of metabolize energy, improve litter quality, maintenance gut integrity, release hidden nutrients for better utilization and absorption, allows economizing feed formulated (east cast formulation).

Many feed additives exist but the ones of concern are the food enzymes which have been shown under certain conditions to improve the digestibility of certain conditions to improve the digestibility of certain feedstuffs. Nutrizyme acts as a proteinase which helps in facilitating the breakdown of nutrients. It improves and increases the micro flora in the GIT. It serves as an additive which aid digestion. Detailed research work has shown that enzymes product that enzymes released significant amount of extra nutrients from feeds. An apparent energy value can be reduced ascribed to enzyme products also amino acids sparing effect, digestible lysine and methionine can be reduced by as much as 5%. According to Adam (1998), enzymes are now almost routine ingredients in poultry feeds. When the feed consumed by an animal is digested easily and quickly, it tends to consume more. Therefore, this work is aimed at assessing the effect of Nutrizyme supplemented diets on rabbit`s production potentials.

General objectives of this study was to determine the zoo-technical performances of the weaner rabbits fed Nutrizyme supplement diets while we specifically determined the zoo-technical performances, the apparent nutrient digestibility as well as the hematological and serum Biochemical of weaner rabbits fed Nutrizyme supplement diets.

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II. METHODOLOGY

The experiment was carried out at the rabbitary unit of the Teaching Research Farm, Federal College of Forestry, Ibadan. The site (7^0 9'N; 3^0 22'E) is located at the vegetation zone of south western part of Nigeria. It has an annual rainfall of about 1300-1500mm and an average relative humidity of about 80-85%, forestry Research of Nigeria (FRIN 2006). The project was carried out between March-April, 2017.

Eighteen weaner rabbits of 6 weeks old weighing 560-566g purchased from a rabbit farm at Ologuneru, Eleyele, Ibadan were quarantined for one week before being allotted on weight equalization basis into three experimental groups with each group having 3 replicates with two rabbits in a replicate. The experiment lasted for 6 weeks. The experimental diets and water were offered to the rabbits between 7:00-7:30 am daily. Oral deworming was done with AbiDOl prior to the commencement of the experimental diets feeding. The pens were usually cleaned up every morning with broom while the wastes were packed into plastic bowls before being thrown away.

Routine observations were maintained daily for any unusual signs and symptoms.

The experiment was designed in a completely randomized design, with 3 treatments in two replicates.

T_1-Diets+No Nutrizyme®
T_2-Diets+125 mg/kg Nutrizyme®
T_3-Diets+250mg/kg Nutrizyme®

The basal experimental diet was compounded before being divided into three equal parts. The Nutrizyme® was added at 0, 125 and 250mg/kg to give treatments 1, 2, and 3 respectively while Treatment 1 served as the control. All the diets contained the same amount of crude protein and energy.

Table.1: Composition of Experimental Diets (%)

Ingredients	level of Nutrizyme in diets(mg/Kg)		
Test ingredient	0ppm	125ppm	250ppm
Maize	45.00	45.00	45.00
Soybean meal	18.00	18.00	18.00
Fishmeal 72%	1.00	1.00	1.00
Wheat-offal	30.50	30.50	30.50
Basal diets	5.50	5.50	5.50
Total	**100.00**	**100.00**	**100.00**
Calculated analysis			
Dry matter	87.78	87.78	87.78
Crude protein	15.75	15.75	15.75
Crude fiber	4.18	4.18	4.18
Ether extract	3.75	3.75	3.75
Nitrogen free extract	56.35	56.35	56.35
Ash	3.80	3.80	3.80
Metabolizable Energy(kcal/kg)	2.60	2.60	2.60

Data Collection

(a) Feed intake: the amount of feed eaten by a rabbit` per treatment was determined weekly by subtracting the amount of feed left in the feeder from the total amount of feed given.

$$FI = (FG - FL)/7\ days \ldots\ldots\ldots\ldots 1$$

Where;
FI = Feed Intake
FG = Feed Gift
FL = Feed left-over

Similarly, the same method was used to determine the weekly and total amount of feed eaten per rabbits throughout the experimental period.

(b) Body weight gain: The body weight gain was determined weekly, and calculated algebraically by subtracting the weight of each replicate of the 7th day from the previous weight as at the 1st day.

$$BWG\ (g) = (FBW - IBW) / 7\ days \ldots\ldots\ldots 2$$

Where;
BWG = Body Weight gain
FBW = Final Body Weight
IBW = Initial Body Weight

(c) Feed efficiency: this was calculated by dividing the weekly weight gained per replicate by the total amount of feed consumed by the rabbit of that replicate.

$$FE = TWG/TFI \ldots\ldots\ldots\ldots\ldots 3$$

FE = Feed Efficiency
WG = Total Weight gain
FI = Total Feed Intake

(d) Apparent Nutrient Digestibility: At the 5th weeks of the experiment, one rabbits was selected from

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each of the replicate and were housed individually in a cage; separate feeders and drinkers were used such that the feed and water could not spill on the dropping. The rabbits were fed a known quantity of their individual experimental diets along with clean water. The droppings were collected, wrapped with aluminum foil and labeled accordingly before being stored in a refrigerator at 60^{0c}. The crude protein (CP), crude fiber (CF), ether extract (EF), nitrogen free extract (NFE) and ash (A) were analyzed according to the standard procedure of A.O.A.C. (2000).Apparent digestibility was calculated using the formulae

$$\boldsymbol{AD\ \% \ = \ (NI - NO)100 \ldots\ldots\ldots\ldots\ldots 4}$$

Where;
AD = Apparent Digestibility
NI = Nutrient Intake
NO = Nutrient Output

Similarly, the same method was applied to the following parameters: Dry matter, Crude
protein, Crude fiber, Nitrogen free extract (soluble carbohydrate), Ether extract (fat), Ash.

(e) Collection of blood samples: Blood samples were collected with or without ethylene-diamine-tetra-acetic acid (EDTA) for heamatological and biochemical analyses according to the method described by Lamb (1981).

Statistical Analysis

All data generated were subjected to one way test (analysis of varience-ANOVA), while the differences in mean were separated using the Duncan Multiple Range Test (1995) at 5% probability.

Table 2: Zoo-technical performances of Weaner Rabbits Fed nutrizyme® supplement diets

Parameters	T1 (0ppm)	T2 (125ppm)	T3 (250ppm)	SEM
Initial weight (g)	560.00	566.00	562.00	4.28
Final weight (g)	1075.00^{c}	1370.00^{b}	1630.00^{a}	1.01
Average weight gain (g)	515.00^{c}	804.00^{b}	1068.00^{a}	0.30
Total feed consumed (kg)	3477.60^{c}	3981.00^{b}	4267.70^{a}	79.85
Average daily weight (g)	12.30^{c}	19.14^{b}	25.42^{a}	3.04
Average daily feed intake(g)	72.80^{c}	94.80^{b}	101.60^{a}	1.44
Feed Efficiency	0.20^{c}	0.21^{b}	0.25^{a}	0.001

abc: means on the same row with different superscripts were significantly different($p<0.05$)

The zoo-technical performance of weaner rabbits fed Nutrizyme® supplemented diets were summarized in the table2. There were significant ($p<0.05$) differences among the treatment means in terms of average final weight, average total weight gain and average daily weight gain. the significant ($p<0.05$) improvement in the total weight and average daily weight gain of rabbits fed diet 3, followed those of diet2 indicated that the test ingredients affected both feed intake and body weight gain of rabbits. This could be as a result of the optimal utilization of the dietary proteins and energy of the experimental diets. Rabbits fed diets 3 (250 ppm Nutrizyme® inclusion) had the highest weight gain (1068.00g), followed by rabbits of diets 1 (515.00g) had the highest least weight gain.

Rabbits fed diets T1, T2,T3 respectively consumed an average 34477.6, 3981.6 and 4267.7g respectively of the diets daily. These values were, however not significant ($p<0.05$). The quality and condition of the feed might have accounted for this. Gabriel *et al.*, (2007) reported that the rate of feed intake in animals depends on the age, sex, physical condition, health and activity of such animal as well as the individual constituent of the feedstuffs.

It is commonly accepted the=at an increase in crude protein content of a feedstuff increase its crude protein digestibility because the proportional contribution of endogenous to total feacal nitrogen had increased (Fraga, 1998).

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Table 3: Hematological and serum biochemical of Rabbits Fed Nutrizyme Supplements Diets

Parameters	**T1** (0pmm)	**T2** (125ppm)	**T3** (250ppm)	**SEM**
Packed cell volume(%)	36.33	40.31	41.06	1.20
Red blood cell	4.03	4.86	4.91	3.04
Heamoglobin conc.(g/u)	10.94	11.03	11.26	0.31
M.C Heamoglobin (Pg)	25.04	26.34	27.03	0.81
Total protein (g/100ml)	5.64	5.88	6.04	4.64
White blood cell ($x10^6$ml)	1.50	1.72	1.88	1.10
Mean Cell Volume (um^3)	76.43	77.53	77.68	0.12

Table 3 shows the heamatological variables (except for hemoglobin concentration and white blood cells), serum metabolic were not significant influenced by dietary treatments. The packed cell volumes (PCV) of 36.03 to 41.06% were within the normal values of 35 t0 45% reported by Siegmund *et al.,* (1973). Also red blood cell counts (RBC) and means cell hemoglobin concentrations (MHHC) were within the range reported for rabbits (CCAC, 1993, Onibi and Popoola, 2006). Although there were no significant differences among treatment means, the values of 76.43 to 77.68 um^3 for mean cell volume (MCV) and 25.04 to 27.03pg for mean cell hemoglobin (MCH) were higher than the 60-68 um^3 MCV and 20.86pg MCH reported by Solomon *et al.,* (1998). The significant ($p<0.05$) lowest heamoglobin concentration for rabbits if T1 (10.94g/d1) and highest for T3 (11.26g/d1) were within the range of 9.4 and 17.5g/d1 for rabbits (CCAC, 1993). The values ($1.5x10^6$ ul) obtained for the white blood cell counts indicated increase in microbial activities within the GIT of the rabbits. Higher values in ascending or with increase in the enzyme supplemented, proved the fact that more white blood cell were able to fight foreign bodies introduced by the enzyme. Since the PCV, RBC and Hb values within the normal range specified for rabbits and the rabbits remained apparently healthy, it is evident that dietary treatment did not have ill effect on the rabbits.

Table 4: Apparent Nutrient Digestibility of Rabbits Fed Nutriyme Supplement Diets

Parameters	Levels of Nutrizyme supplementation			
	T1(0g)	T2 (125g)	T3 (250g)	SEM
Dry matter(%)	76.43	78.33	81.41	0.91
GP digestibility	75.88	78.00	80.01	0.71
GF digestibility	32.42	36.83	37.03	0.44
EE digestibility	86.88	89.10	90.30	0.31
Nitrogen free extract (%)	66.31	77.37	78.20	0.23
Ash digestibility (%)	52.34	56.31	57.01	0.53

abc: means on the same row with different superscript were significantly different ($p<0.05$).

Table 4 shows the apparent nutrient digestibility of the experimental diets by rabbits. There were significant ($p<0.05$) differences in the nutrient digestibility of rabbits fed diets supplemented with Nutrizyme. This revealed the ability of rabbits to utilize fibrous materials due to the microbial activity in the ceacum (Famino *et al.,* 2006). Rabbits can easily take advantage of the nutrients contained in cellulose rich feeds where as chicken cannot easily fed economically on cellulose feed (Lebas, 1983). Church and Pond (2004) reported that the rate and quality of nutrient digestibility in non-ruminant depends on the amount of flora in the ileum which consequently depends on available nutrients, transit rate, the anti-nutritional substances in the diets, age, sex and strain, rearing environment as well as the nature of feed ingredient. Values obtained in this study agreed with work of Onibi and Popoola (2006).

III. CONCLUSION AND RECOMMENDATIONS

Based on the experimental result it was concluded that growth response indicated better performance of rabbit fed diets supplemented with Nutrizyme and that enzyme supplementation was most effective for rabbits at 250mg/kg. level of inclusion as seen in daily feed intake and daily weight gain. Rabbits fed Nutrzyme supplemented

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diets had better nutrient digestibility in all nutrient components assessed. Hence it was recommended that Nutryzyme should be included in the diets of weaner rabbits at 250mg/kg for optimum result and that Further research into the composition of high dietary fiber and non-starch polysaccharides (NSPs) in rabbit`s diets and effect on the intestinal viscosity should be determined. The effect of other multi-enzyme on maize based diets should also be investigated.

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