GROWTH INDICES AND CARCASS CHARACTERISTICS OF GROWER RABBITS FED GRADED LEVELS OF RIPE PLANTAIN (*Musa paradisiaca*) PEELS SUPPLEMENTED WITH PHYTASE ENZYME

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ABSTRACT
A feeding trial was conducted using 27 New Zealand White growers' rabbit (8 weeks of age) to assess growth performance and carcass characteristics of the rabbits fed graded levels of ripe plantain (Musa paradisiaca) peels supplemented with phytase enzyme. The rabbits were randomly assigned into three (3) treatment and three (3) replica with nine animal per treatment and three animal per replicate, in which ripe plantain peels supplemented with phytase enzyme was used to partially replace maize at 0%, 20%, 40% respectively. Feed and water were given ad-libitum during the period of the study. At the end of the feeding trail, one rabbit from each replicate was selected and starved for 6hrs without feed but only water was given, so as to reduce the intestinal content of the animal. The rabbits were weighed and slaughtered and the visceral organs were eviscerated. The result showed that growth indices of the rabbits reduced with increase in inclusion of test feed ingredients. There was no significant effect (p>0.05) of the dieatary treatments on carcass characteristics of the rabbits except hind limb and kidney. Diet containing plantain peels supplemented with phytase enzymes did not have any significantly effects (p>0.05) on the growth performance of growing rabbits. It was concluded that rabbit can tolerates plantain peel in their diets at 40% level of inclusion without any detrimental effects on the growth performance and carcass.
Keywords: Enzyme, Peel, Performance, Plantain, Rabbit

INTRODUCTION

Rabbit production is becoming increasingly important in the tropics particularly Nigeria because they are easy to manage, require a small space, able to thrive on forage and has short generation interval. (Adeyeye *et al*., 2017). Ufele *et al*, 2013 reported that the rapid growth of human and livestock population is creating an increase in the requirements for food and feed in less developed countries. This has led to an increased demand for food and protein of animal origin which is in short supply. FAO, (2006) estimated the average protein consumption in Nigeria to stand at 8g/capita/day which is in sharp contrast to 38g/capita/day recommended for an individual per day (FAO, 2006).

Plantain peel is an agro-industrial waste obtained from platain, the peel can be potentially used as a rabbit feed ingredient as source of energy. Ajasin *et al*. (2006) observed that plantain peels have some nutritional values as it contains about 12% crude protein, 16% crude fibre, and 1300kcal/kg energy on dry matter basis. However, it is well known that plants generally contain antinutrients most of the toxic and antinutrient effects of these compounds could be removed by several processing methods (Soetan, 2008). El Adawy (2002) reported that phytase can play an important role to improve the rabbit utilization of diet rich in phytic acid. This study seeks to assess growth performance and carcass characteristics of grower rabbits fed graded levels of ripe plantain peels supplemented with phytase enzyme

MATERIALS AND METHODS

Location of the study and Test ingredients

The experiment was carried out at the Teaching and Research farm Bora, Federal College of Animal Health and Production Technology, Moor plantation, Ibadan. Ibadan is located on longitude $03^0$51E, latitude$07^0$23N and altitude 65^0S, in the humid zone of rain forest belt 0703.25 of south western Nigeria. Ecologically it is in the rainforest zone experiencing mean annual rainfall of 1220mm and mean temperature of 26^0C with two seasons-the dry and wet season. (Google Earth, 2018) and lasted for a period of 40 days. Plantain peel was gathered, washed and chopped into smaller pieces and sun-dried for several days until a constant weight was obtained. It was stored in an air-tight container prior to mixing with other feed ingredients and used in formulation of the rabbit diets in pelletized form.

Experimental Animals, Design and Management of study Animals

Three experimental diets were formulated with inclusion of plantain peel supplemented with phytase enzymes (0.2) which were: T_1 was the control without plantain peel using maize supplemented with phytase enzymes, T_2

has inclusion of 20% plantain peel supplemented with phytase enzymes and T_3 has inclusion of 40% plantain peel supplemented with phytase enzymes. Twenty-seven grower Rabbits of New Zealand white (8weeks) were randomly allotted into the three dietary treatments with nine rabbits per treatment and replicated 3 times with 3 rabbits per replicate in a completely randomized design; each treatment was replicated three times with three rabbits per replicate. Feed and water were given to the animal *ad libtum, coccidiostat* and antibiotics were also given to immune them and the test ingredient were grinded with the feed during milling. The experiment lasted for 40days.

Data collection and Measurement of Production Performance Characteristics

The initial weight of the animal was measured before the commencement of the growth performance trial, then the feed intake was measured on daily bases by subtracting feed given from left over. The weight of the animal was also measured on weekly bases and at the end of the experiment. The weight gain is measured with final weight minus initial weight. And feed conversion ratio is determined by total feed intake over weight gain. At the end of the feeding trail, one rabbit from each replicate was randomly selected and starved for 6hrs without feed but only water was given to them, so as to reduce the intestinal content of the animal. The rabbits were weighed and slaughtered and the visceral organs were eviscerated. The live weight, Slaughter weight, De-skin weight, Eviscerated weight, Carcass weight, and the cut parts (fore limb, hind limb, thorax, head, loin, neck) and visceral organs (liver, kidney, lungs) were expressed as the percentage of live weight for each animal, they were also weighed and recorded.

Statistical Analyses

Data were analysed using ANOVA and using SAS version 9.3.1. Treatment means were separated using Duncan multiple range test 5% level of significance.

Table 1: Formulation of experimental diets

Ingredients kg	T_1	T_2	T_3
Maize	40.00	32.00	24.00
Plantain peel	-	8.00	16.00
Rice bran	30.00	30.00	30.00
Soya meal	24.00	24.00	24.00
Fish Meal	1.00	1.00	1.00
Palm kernel oil	3.00	3.00	3.00
Phytase Enzyme	0.2	0.2	0.2
Premix	0.2	0.2	0.2
Bone	1.40	1.40	1.40
Salt	0.2	0.2	0.2
Calculated CP%	17.38	18.47	18.58
CF%	5.01	4.64	6.99
ME (kcal/kg)	2569.48	2477.59	2571.34

CP – Crude Protein; CF - Crude Fat; ME – Metabolized Energy

RESULTS AND DISCUSSION

Weight gained and daily feed consumed by the rabbits were significantly affected by the dietary treatments (Table 2). There was no significant difference ($p > 0.05$) in initial weight, final weight, daily weight gained, total feed consumed and feed conversion ratio among the dietary treatments. Rabbits fed diets without plantain peel using maize supplemented with phytase enzymes recorded highest weight gained and daily feed consumed while the lowest values of weight gained and daily feed consumed were obtained in rabbits fed diets containing 40% plantain peel supplemented with phytase enzymes. The lowest daily weight gained and final weight recorded at 40% (PP) could be as a result of lowest total feed consumed and daily feed consumed by the rabbits; similar result was obtained by Ajasin *et al* (2006) who also reported that the differences in the weight gain could also be due to the quality of the protein content of plantain peel and maize in terms of essential amino acids. The result showed general trend of decrease in the growth performance parameters of the rabbits with increase in plantain peel supplemented with phytase enzymes. Similar results were reported by Ajasin *et al* (2006); Nuriyasa *et al*., (2020); Fanimo and Oduronbi (1996). However, efficiency of feed utilization was relatively the same accross the dietary treatments with highest value obtained at 40% (PP), which implies that the rabbits could still convert the feed to edible when maize is substituted up to 40% plantain peel supplemented with phytase enzymes in the diet.

Table 2: Growth performance indices of rabbits fed graded level of ripened plantain peel

Parameters (g/r)	**T_1 (0% PP)**	**T_2 (20%PP)**	**T_3 (40% PP)**	**SEM (±)**
Initial weight	1960.00	1983.30	1976.70	17.90
Final weight	3473.30	3396.70	3190.00	64.27
Weight gained	1513.30[a]	1413.40[b]	1213.30[c]	70.69
Daily weight gained	400.00	333.00	333.50	17.60
Total feed consumed	3473.30	3396.70	3386.70	90.61
Daily feed consumed (g/r/day)	126.70 [a]	108.70 [b]	100.00 [b]	4.84
Feed conversion ratio	2.29	2.24	2.79	0.13

[a,b,c]means within the same row with different superscript are significant ($p<0.05$) ; SEM -Standard Error Mean ;PP- Plantain Peel

Table 3 shows the carcass characteristics of grower rabbits fed graded level of ripe plantain peels supplemented with phytase enzymes. Results show significant effects of dietary treatments on hind limb and kidney of the rabbits. However, there was no significant effect ($p<0.05$) of dietary treatments on others carcass parameters of the rabbit measured. The result obtained disagreed with that of Fanimo and Oduronbi (1996) who reported significant differences in dressing percentage, lumbar regIon weight, viscera weight and breast weight of rabbits fed ripe dried platain peel. The authors also reported no significant difference ($p< 0.05$) in the weights of the various organs except kidney and hind limb.

Table 3: Carcass Characteristics of Growers Rabbits Fed Graded Level of Ripened Plantain Peels supplemented with phytase enzymes

Parameters	**T_1 (0%PP)**	**T_2(20%PP)**	**T_3(40%PP)**	**SEM (±)**
Live weight (kg)	3193.33	3143.33	2975.00	59.25
Slaughter weight[1]	95.73	95.02	94.96	0.73
De-skin weight[1]	90.39	89.28	89.16	2.18
Eviscerated weight[1]	70.98	71.95	74.19	2.58
Carcass weight[1]	59.27	61.04	61.53	2.51
Fore limb[1]	10.49	10.54	12.67	1.33
Hind limb[1]	22.03[b]	21.75[b]	24.58[a]	2.49
Thorax[1]	12.42	11.78	15.11	2.81
Loin[1]	16.78	17.18	14. 95	1.79
Head[1]	8.07	8.49	8.49	1.21
Neck[1]	3.04	2.95	2.79	0.31
Liver[1]	3.04	3.26	3.04	0.20
Kidney[1]	1.21[c]	1.57[b]	1.52[a]	0.29
Lungs[1]	1.37	1.74	1.38	0.32

[a,b,c] means within the same row with different superscript are significant ($p<0.05$), [1] is expressed as percentage (*%*) of live weight; SEM – Standard Error Mean; PP – Plantain Peel

CONCLUSIONS

Diet containing plantain peels supplemented with phytase enzymes did not have any deleterious effects on the performance of growing rabbits and could be used as partial replacement for maize up to 40% inclusion level, this could also improve the carcass traits of the rabbits.

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