



## **Growth Performance and Digestibility in Growing Rabbits Fed Diet Supplemented with Powdered Ginger**

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### **Author's contribution**

*The sole author designed, analysed, interpreted and prepared the manuscript.*

### **Article Information**

#### Editor(s):

(1) Dr. Osama Anwer Saeed, Department of Animal Production, College of Agriculture, University of Anbar, Iraq.

#### Reviewers:

(1) Maria Cristina de Oliveira, University of Rio Verde, Brazil.  
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(3) Ahmed N. F. Neamat-Allah, Zagazig University, Egypt.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/52553>

**Original Research Article**

**Received 14 September 2019**

**Accepted 18 November 2019**

**Published 02 December 2019**

### **ABSTRACT**

Sixteen (16) California white weaned rabbits of both sexes with average age of 6 weeks old weighing an average of 451.16 g were placed on four dietary treatment (4 rabbits per treatment) for ten (10) weeks. The experiment was designed to investigate the growth performance and digestibility in growing rabbit fed diet supplemented with ginger. The diet T1, T2, T3 and T4 contain of 0 kg of ginger, 0.25 kg of ginger, 0.5 kg of ginger, 0.75 kg of ginger respectively. Result obtained showed that rabbits growth performance increases with the increase in the inclusion of ginger with the highest weight gain in dietary T4(0.75 kg) with weight gain of 976.96 g, The feed intake was highest in T4(0.75 kg) with the feed intake of 45.39 g and the lowest feed efficiency ratio was recorded in T4 (0.75 kg) with feed efficient ratio of 3.17. The varying level of inclusion of ginger did not significantly affect the digestibility of dry matter, crude fiber, nitrogen free extract and ether extract. The crude protein was significant with T4 (0.75 kg) with the highest apparent digestibility of 78.62% to obtain maximum performance. Higher levels of incorporation of ginger resulted in increase in growth performance and digestibility therefore should be encouraged at T4 (0.75 kg).

**Keywords:** *Weight gain; feed intake; feed efficiency ratio; nutrient digestibility.*

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## 1. INTRODUCTION

Livestock production represents a major investment with important economic, nutritional and social implications for the country. According to Bamgbose et al. [1] the level of animal protein consumption has direct influence on the general wellbeing and health of the ever increasing population. To bridge the existing protein deficiency gap since the inadequate production of food from animal origin as led to the manifestation of nutritional diseases include: nutritional marasmus, kwashiorkor, nutritional anemia, iodine deficiency and vitamins. A deficiency livestock production must be recognized as an area of great potential.

Rabbits have been recognized to have a very important role to play in the supply of animal protein to Nigerians, especially in the rural and peri-urban areas. Rabbit meat production has been on the increase in Nigeria in recent years [2].

They are converters of different feed to meat and can utilize up to 30% crude fiber as against 10% by most poultry species [3]. Rabbits can thrive even on forage alone, but to reach a very good productive performance, it is necessary to improve their nutrition. Several advantages derived from rabbit keeping include relatively low cost of production, high nutritional quality meat, high efficiency in converting forages to meat and its ability to digest large amount of fibrous materials in the ceacum. Rabbits become mature early, their meat has high protein and low levels of fat, energy and cholesterol. The meat is white, finally grained, delicate and appetizing [4]. The meat does not form uric acid during metabolism and hence is recommended for diabetic, hypertensive patients and the middle aged. Despite these advantages, rabbit production has not been explored to any great extent as animal Protein sources in Nigeria.

Ginger (*Zingiber officinale*) is a perennial plant which belongs to family Zingiberaceae. It is widely used in many countries as a food spice and as herbal remedy [5]. Ginger may act as a Pro-nutrient because of vast active ingredients that is present in it. Herbs Hands Healing [6] reported that ginger contains volatile oils like borneol, camphene, citral, eucalyptol, linalool, phenllandrene, zingiberine, zingiberol (gingerol, zingirone and shogaol) and resin. Ginger have medicinal properties which are chemicals responsible for the taste, the most noteworthy

being gingerol and shogaol. Ginger speeds digestion, and enhances by- pass protein digesting enzyme (*zingibaine*) found in ginger. It has antibacterial and anti-inflammatory actions, and ginger rhizome is known to lower blood cholesterol level in human.

### 1.1 General Objective

Was to determine growth performance and digestibility of growing rabbits fed diet supplemented with ginger.

### 1.2 Specific Objectives

The specific objectives of the study were to:

- Determine the growth performance of growing rabbits feed supplemented with ginger
- Determine the effect of ginger on the nutrient digestibility in growing rabbits

## 2. MATERIALS AND METHODS

### 2.1 Location

The experiment was carried out at the Rabbitry Unit of Osun State University, Department of Animal Science, Ejigbo Campus, Osun State, Nigeria. The protocol was approved by Animal Care and Use Committee of Animal Science Department, Osun State University.

### 2.2 Experimental Animal and Duration

A total of 16 California white rabbits of both sexes were used for the experiment. All rabbits were 6 weeks and their mean weight was  $451.16 \pm 2$  g. The rabbits were purchase from Olaoluwa Farm, Oko, Oyo State. The experiment was carried out for ten weeks.

### 2.3 Housing and Experimental Design

Rabbits were randomly allocated to the four dietary treatments with four rabbits per treatment placing one rabbit per cage. The design used was complete randomize.

### 2.4 Experiment Material

**Cage:** It was constructed using wire mesh for easy dropping of feces and urine (self-cleaning cage). Each compartment (65 cm by 90 cm) has front opening for easy access to the animals in

terms of feeding, water supply and medication. The cage and its environment was kept thoroughly clean by sweeping and washing of the rabbitry floor using disinfectant called Lysol.

**Feeding and watering troughs:** Each cage has a feed trough which prevents feed wastage for accurate feed intake measurement with a water trough for supplying water.

## 2.5 Feed and Preparation

There were four feed treatments labeled A, B, C and D. Feed A was the control feed without ginger powder, B with 0.25 kg of ginger powder, C with 0.5 kg of ginger powder and D with 0.75 kg of ginger powder each in 25 kg of the feed. The feed formulation use is shown below.

**Table 1. Gross composition of feed**

Feed ingredient	Kilogram
Maize	45
Soybean	25
Wheat offal	20
Bone meal	4.5
Oyster shell	5
Lysine	0.1
Methionine	0.1
Salt	0.1
Grower premix	0.2
<b>Total</b>	<b>100</b>

**Table 2. Proximate composition of feed**

Dry matter	93.2%
Crude protein	15.5%
Crude fibre	15.0%
Ether extract	4.9%
Ash	25.6%
Digestible Energy(kcal/kg)	2550

## 2.6 Processing of Ginger Rhizome Powder

Fresh rhizome of ginger was sourced from Ogiyan market, Ejigbo, Osun State. The fresh ginger rhizomes were washed in water to remove adhering dirt's. They were chopped into smaller pieces using kitchen knife and dried under shade for 5 – 6 days to prevent volatilization of its essential oils by direct sunlight. The air dried samples were milled into fine particle sizes using

Laboratory mill. The grinded samples were sieved through 2 mm test sieve and thereafter incorporated into the diets.

## 2.7 Feeding

Feeding was *ad-libitum* in which the formulated feed was offered to the animal in the morning between 7 am to 8 am and 70 g basal ration (*Tridax procumbens*) was given to the animal in the evening. The feed and water trough were cleaned daily and stale feed and water discarded before feeding every morning. Feeding lasted for 10 weeks.

## 2.8 Medication

Prophylactic treatment of coccidiosis administered through drinking water was given to the experimental unit at the third and fourth week due to symptoms of coccidiosis observed in some of the experimental units.

## 2.9 Data Collection

The following parameters were evaluated; Daily Feed Intake, Average Body Weight, Average Body Weight, Average Weight gain and The Feed Conversion Ratio.

## 2.10 Nutrient Digestibility

During the last week of the experiment, fecal droppings from each animal were collected, weighed, mixed and aliquots were taken daily. The daily aliquots and the respective feed samples for each animal were oven-dried in an air circulating oven at 105°C for 24 hours (to determine their dry matter contents) for further analyses. The chemical compositions of the experimental diets (Table 2) and fecal samples collected, which were used to calculate the apparent digestibility of dry matter (DM), organic matter (OM), crude protein (CP), ether extract (EE), crude fiber (CF), ash and nitrogen-free extract (NFE), were determined by the method of AOAC (2001).

## 2.11 Statistical Analysis

All data collected were subjected to analysis of variance (ANOVA) means using procedure of SAS (1995) where mean significant differences were observed, means were compared using LSD of the same package.

### 3. RESULTS AND DISCUSSION

Final weight range from 1260 g to 1428.15 g, the final weight were significantly different ( $p < 0.05$ ). T4 had the highest final weight and this result show that weight gain ranged from 808.77 g (T1) to 976.96 g (T4) while daily weight gain ranged from 11.22 (T1) to 14.30 g/day (T4). The daily weight gain and weight gain of T4 were also significantly higher ( $p < 0.05$ ) than other treatment. It would be thus inferred that ginger spice tended to positively influence the appetite and feed utilization of the rabbits since the daily feed in take ranged from 38.12-45.39 g. The feed intake of the rabbits given the diet without spice T1 (control) was the least, confirming the flavoring agent(ginger) stimulated an increase in feed intake among rabbits that were feed on ginger species whose effect could be due to smell or taste as stated. This finding is in line with the observation of Okoye et al. [8] and Onu P.M and Aja P.N [8]. T4 had higher significant ( $p < 0.05$ ) than others with high daily feed intake 45.39 g/day in term of utilization of treatment diet by the rabbits, T4 has better feed efficiency ratio, there is significant difference ( $p < 0.05$ ) across the treatment.

The higher body weight was noted in the rabbit fed ginger powder might be due to the beneficial effects of these herbs in animal nutrition which includes improvement of endogenous digestive

enzyme secretion, activation of immune response and antibacterial, antiviral, antioxidant and anthelmintic actions. All these actions cause improvement in health, growth and performance of broiler [9]. The main important compounds in Ginger (*Zingiber officinale*) are gingerol, gingerdiol and gingerdione which have the ability to stimulate digestive enzymes, affect the pathogenic microbial flora in the small intestine which compete the host for nutrients [10]. All these positive effects lead to increase in production and improve animal's health [1].

Apparent digestibility in weaners rabbits fed feed containing graded levels of ginger did not significantly ( $P > 0.05$ ) affect the digestibility of dry matter, crude fibre, nitrogen free extract and ether extract although slightly better, but not significant.

The crude protein were significantly influenced by the experimental diet ( $p > 0.05$ ). There was a proportional relationship between dietary crude protein digestibility as well as the feed intake which increases as the inclusion of ginger increases. This is as a result of the ginger Amino acids (e.g. arginine, aspartic acid, cysteine, glycine, isoleucine, leucine, serinc, threonine and valine), protein (about9%), resins, diterpenes (galanolactone), (huang et al., 1991) or probably due to the fact that ginger stimulates digestive enzyme secretion.

**Table 3. Growth performance of growing rabbits fed diets supplemented with ginger powder**

Parameters	Ginger powder percentage				±SEM
	0%	0.25%	0.50%	0.75%	
Initial weight(g)	451.23	451.20	451.03	451.19	20.03
Final weight (g)	1260.00 <sup>d</sup>	1284.40 <sup>c</sup>	1374.66 <sup>b</sup>	1428.15 <sup>a</sup>	83.26
Weight gain (g)	808.77 <sup>c</sup>	833.20 <sup>c</sup>	923.63 <sup>b</sup>	976.96 <sup>a</sup>	44.78
Daily weight gain (g/day)	11.22 <sup>d</sup>	12.20 <sup>c</sup>	13.19 <sup>b</sup>	14.30 <sup>a</sup>	2.03
Daily Feed intake (g/day)	38.12 <sup>c</sup>	38.69 <sup>c</sup>	43.23 <sup>b</sup>	45.39 <sup>a</sup>	5.64
Feed efficiency ratio	3.39 <sup>c</sup>	3.48 <sup>b</sup>	3.61 <sup>a</sup>	3.17 <sup>d</sup>	0.38

a, b, c, d: Means on the same row with different superscript are significantly ( $P < 0.05$ ) different

**Table 4. Apparent digestibility in growing rabbit fed diet supplemented with ginger powder**

Parameters (%)	Diets (inclusion level)				SEM
	(0%)	0.25%	0.50%	0.75%	
Dry matter	64.03	65.29	65.33	65.84	6.02
Crude protein	69.07 <sup>c</sup>	73.43 <sup>b</sup>	78.02 <sup>a</sup>	78.62 <sup>a</sup>	5.87
Crude fibre	65.02	66.03	65.24	67.01	7.64
Ether extract	58.02	58.74	61.03	67.73	6.77
Nitrogen free extract	74.02	74.49	75.04	75.67	8.03

a, b, c: Means on the same row with different superscripts are significantly ( $P < 0.05$ ) different

## 4. CONCLUSION AND RECOMMENDATION

### 4.1 Conclusion

- The result obtained in this study indicate that ginger support optimum growth of weaners rabbit and highest growth is at 0.75 g(T4) inclusion
- The result also indicates that ginger inclusion support protein digestibility without affecting the digestibility of other nutrient.

### COMPETING INTERESTS

Author has declared that no competing interests exist.

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