GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF GROWER RABBITS FED DIET SUPPLEMENTED WITH GRADED LEVELS OF GARLIC (Allium sativum) MEAL

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ABSTRACT

The study was conducted to evaluate the effect of garlic meal supplementation on growth performance and carcass characteristics of grower rabbits. A total of twenty four mongrel grower rabbits, aged 7-8 weeks were housed in hutches, and feed and water were supplied ad libitum. The rabbits were randomly allotted to four dietary treatments in a completely randomized block design, with each treatment having six replicate in which each rabbit forms a replicate. Garlic meal was supplemented in the four diets with 0.00 % , 0.20 %, 0.40 %, and 0.60 % for T1, T2, T3 and T4 respectively. Final weight was comparable across the dietary treatments, T1 (1334.67 g), T2 (1424.40 g), T3 (1475.50 g) and T4 (1533.60 g) . Weight gain was statistically the same for T2 (516.0 g), T3 (471.25 g) and T4 (534.40 g) However, weight gain and feed conversion ratio followed a similar trend. Live and dressed weights were significantly better at inclusion of (0.60%) of garlic meal .Therefore, it was concluded that growing rabbits can be fed diets containing garlic meal for improved performance in terms of growth, better feed utilization and carcass characteristics.

Keywords: Garlic Meal, Growth, Performance, Rabbits, Supplement.

INTRODUCTION

Rabbit production is very promising given the fact that it provides good quality meat to man (Djakaliaet al., 2011). Rabbit production plays a major role in bridging the protein gap in developing countries where average consumption is still far below the recommended standards (FAO, 1989). Hence, feed additives are used to improve growth performance and economic benefits of rabbit production. The use of antibiotics to improve growth performance and feed efficiency or to synchronize the reproductive cycle and breeding performance also often leads to harmful residual effect. However, phytochemical analyses of some herbs and spices such as Garlic, Turmeric. Rosemary, curry leaves, Scent leaves e.t.c., have been shown to improve the performance and also reduce the bacterial load in non-ruminant livestock (Hume, 2011).

Demir (2005) in his experiment demonstrated that garlic may be used as alternatives to an antibiotic growth promoter in broiler production. Javandel et al., (2008) also reported that the use of natural feed additives like garlic has made it possible to avoid the harmful effects of synthetic antibiotics. Garlic supplements in broiler chickens have been recognized for their strong stimulating effect on the immune system and their very rich aromatic oils enhance digestion in birds (Gardzielewska et al., 2003). The key active ingredients in garlic is a powerful chemical called allicin, which rapidly decomposes to several volatile organo sulphur compounds

with biqoactivities (Chang and Cheong, 2008). Garlic is used both as condiments and medicaments, anticoagulant, antioxidant, hypolipidaemic, anti-hypertensive, anti-ageing, anti-platelet and heavy metal detoxifier (Agarwal, 1996).

Phytobiotics have drawn a lot of attention because of being natural, non-toxic and residue free. Phytogenic feed additives are commonly defined as plant–derived compounds incorporated into diets to improvelivestock productivity through amelioration of feed properties, improvement of nutrient digestibility and absorption, and elimination of pathogens in the gut (Abdel-Azeem, 2005; Abou-Bakr, 2011). Phytogenic feed additives (PFA) include herbs(non–woody flowering plants known to have medicinal properties), spices(herbs with intensive scent or taste commonly added to human food)and essential oils(aromatic oily liquids derived from plant materials such as flowers, leaves, fruits and roots) (Windisch, et al., 2008).

From the foregoing, this study was carried out to evaluate the growth performance and carcass characteristics of growing rabbits fed diets supplemented with garlic (Allium sativum) meal as phytobiotic.

Materials and Methods

Experimental site

The experiment was conducted at the Rabbitary Unit of Samaru College of Agriculture, Ahmadu Bello University, Zaria, Kaduna State. Zaria, city in the Northern Guinea Savannah Ecological Zone, is located on longitude 11° 09' 01.78'' N and $7^{\circ}39'14.79''$E, and 671 m above sea level. The climate is characterized by a well-defined dry and wet seasons. The climate is relatively dry with a mean annual rainfall of 700-1400mm, The mean minimum daily temperature is from 14^0 – 24^0C during the cold season while the mean maximum daily temperature is from 19^0 to 36^0 C during the hot season. The mean relative humidity during dry wet season is 21% and 72% respectively.(IARMS, 2019).

Processing of Garlic (Allium sativum) meal used for the study

Fresh garlic was purchased from Sabo n gari market in Zaria, and sundried for a period of five days. After which foreign materials such as stones were removed from the garlic. The dried sample was then milled and packed in a polythene nylon until when needed.

Experimental design and management of rabbits

A total of 24 grower rabbits (of about eight weeks of age and 600g to 950g in weight) of mixed sexes and breeds were sourced from the Rabbitary Unit,National Animal Production Research Institute (NAPRI), Shika, Zaria, Kaduna State.The rabbits were kept for a period of one week to get them acclimatized to the new environment, during which the following prophylactic treatments were given; Ivermectin injection (0.2ml / head) was administered sub - cutaneously against endo and exo – parasite, oxytetraxycline (0.2ml / head) was also administered intramuscularly to treat against bacteria infections. Coccidiostat was administered orally as a preventive measure against coccidiosis. The animals were housed individually in a hutch 120cm x 50cm x 40cm) made of strong wire mesh raised to a height of 75cm from the

concrete floor. They were randomly assigned to four dietary treatments in a completely randomized block design (CRBD). Each treatment had six replicate,in which each animal form a replicate and were fed ad libitum with experimental diets for a period of 56 days. Clean water was supplied throughout the experimental period; other management practices were keenly observed.

Experimental diets

A standard common concentrate diet consisting of Maize, Groundnut cake, Soya cake, Maize offal, bone meal, common salt, methionine, lysine and vitamin premix was formulated. The diet contained 21% crude protein and 2830 kcal ME/kg to meet the nutrient requirements for grower rabbits. The gross composition of the concentrate diet is as shown in Table 1. Garlic meal was included at graded levels of 0%, 0.20%, 0.40% and 0.60% respectively to form four experimental diets and were supplied adlibitum while 50g of chopped Digitaria smutsii was supplied alongside with the concentrate diets to boost the dietary fibre level.

Growth study

Initial and final weights of the rabbits were taken at the beginning and at the end of the experiment. Weight gain, feed consumption, feed conversion ratio and feed cost and cost per kg of weight gain were calculated per rabbit. Mortalities were also recorded as it occurred.

Carcass evaluation

At the end of the eight weeks feeding trial, two rabbits were selected from each treatment and were taken to the Animal Product Processing Laboratory of the Department of Animal Science , Ahmadu Bello University, Zaria. The rabbits were fasted overnight (12 hours) but water was supllied. The Liveweight of the rabbits were determined and recorded before slaughtering using a sharp kitchen knife. They were then slaughtered, dressed and weighed individually. The slaughtered animals were thoroughly bled by hanging head down through the hind legs on a rail and then flayed. The carcass was cleaned with water and properly drained. The carcass was dissected to evacuate the viscera part. The eviscerated carcass was then cut into parts, each primal part (thighs, ribs, neck, forelimbs, hind limbs back and loin) was weighed with the aid of a digital electronic weighing balance model EK 9325 (maximum capacity of 1g). The organ weights (lungs, stomach, heart, kidney, liver and intestine) were also recorded.

Statistical analysis

Data were subjected to Analysis of Variance (ANOVA) using the General Linear Model of Statistical Analysis System (SAS, 2002). The difference between treatments means were separated at 5% using Duncan Multiple Range Test. Significant mean was separated.

Table 1: Ingredient and chemical composition of concentrate diet for growing rabbits

Ingredients	Quantity (%)
Maize	35.00
Maize offal	27.00
Ground nut cake	15.00
Soya cake	20.00
Bone meal	2.00
Common salt	0.30
Methionine	0.25
Lysine	0.20
Vit-min premix	0.25
Calculated	**Analysis**
ME (kcal/kg)	2830
Crude protein (%)	21.00
Crude fibre (%)	6.14
Ether extract (%)	3.46
Calcium (%)	0.46
Phosphorus (%)	0.80
Methionine (%)	0.41
Lysine (%)	0.71
Cost (₦/kg)	101.84

Vitamin premix supplied the following vitamins and trace elements per kg diet: Vit A (7812.5 IU), Vit D3 (1562.5 IU), Vit E (25.0mg), Vit K3 (1.25mg), Vit. B1 (1.8mg), Vit B2 (3.44mg), Niacin (34.4mg), Calcium Pantothenate (7.19mg), Vit B3 (3.1mg), Vit B12 (0.02mg), Choline Chloride (312.5mg), Folic Acid (0.6mg), Biotin (0.1mg), Manganese (75mg), Iron (62.5mg), Zinc (50.0mg), Copper (5.3mg), Iodine (0.9mg), Cobalt (0.2mg), Selenium (0.1mg), Antioxidant (75mg).

Experimental Diets:
Treatment 1: Concentrate diet + 0.00% Garlic meal
Treatment 2: Concentrate diet + 0.20% Garlic meal
Treatment 3: Concentrate diet + 0.40% Garlic meal
Treatment 4: Concentrate diet + 0.60% Garlic meal

Results and Discussion

Growth Performance of Growing Rabbits Fed Diets Supplemented With Allium Sativum

The growth performance of growing rabbits fed diets supplemented with Allium sativum as phytobiotic is presented in Table 2. The result showed that there were significant differences ($p<0.05$) in weight gain, feed conversion ratio and feed cost per kg gain across the dietary treatments while feed cost (₦) and percent mortality showed no significant difference ($p>0.05$). Weight gain were significantly higher ($p<0.05$) in rabbits fed diets supplemented with Allium sativum at 0.20% (516.00g),0.40% (471.25g) and 0.60% (534.40g) per kg diet than in the control group (391.17g). Increase in weight gain in the treatment groups fed dietary supplements of Allium sativum could be attributed to the antimicrobial effect of garlic in reducing the pathogenic strains of bacteria while increasing the population of the beneficial bacteria, thereby enhancing effective digestion of feed and nutrients utilization. This observation is in agreement with the report of Pandey et al (2015) who reported that phytogenic feed additives stimulates higher feed intake and has antimicrobial effect in the gut of livestock, thereby improving growth of the animals. Aporn et al. (2008) also suggested that garlic

meal as antibiotic growth promoter could maintain productive performance in monogastrics.

Feed conversion ratio was better in rabbits fed diets containing Allium sativum at 0.20% (5.97), 0.40% (6.10) and 0.60% (5.69) per kg diet than in the control group (7.84). Feed cost per kg weight gain was significantly ($p<0.05$) better in rabbits fed diets containing Allium sativum at 0.20% (₦617.00), 0.40% (₦639.65) and 0.60% (₦605.25) per kg diet than in the control group (₦798.43). Better feed conversion ratio in rabbits fed diets containing garlic as phytobiotics is an indication of improved efficiency of conversion of diets to meat, and this could be due to enhanced activity of the caecal microbes and improved immune status of the animals. This result agreed with the findings of Ahmed et al (2002); Onu and Aja (2011), These authors pointed out that live weight, daily weight gain and feed conversion ratio were significantly improved by dietary suplementation of garlic in rabbit diet. The results obtained in this study is also in line with the report of Gardzielewska et al. (2003), who reported that garlic supplementations in broiler chickens have been recognized for their strong stimulating effect on the immune system and its very rich aromatic oils which enhance digestion in birds and overall performance. However, the result obtained in this study contradicts the findings of Shashikanth et al (1986) and Mohammad (2007) who reported that the long term feeding (4 weeks) of raw and boiled garlic extract to albino rats resulted in weight loss.

Carcass characteristics of growing rabbits fed diets supplemented with garlic (Allium sativum).

The result in Table 3 shows the carcass and organ evaluation of growing rabbits fed diet supplemented with Allium sativum at different inclusion levels as phytobiotics. The result showed that most of the evaluated parameters were affected ($p<0.05$) by the dietary treatments except for percent thoracic cavity, loin and intestine. Live weight were statistically similar across the treatments while the dressing percentage showed no significant ($p>0.05$) difference. Similarity observed in the dressing percentage across the dietary treatments is in consonance with the finding of Lydia (2001) who reported that there were no significant differences in the carcass percentage and organ weight of broiler chickens fed varying levels of garlic.

Table 2: Growth performance of growing rabbits fed diets supplemented with garlic (Allium sativum)

	Levels of Allium sativum (%)				
Parameters	**0.00**	**0.20**	**0.40**	**0.60**	**SEM**
Initial weight (g)	943.50	908.40	1004.25	999.20	75.12
Final weight (g)	1334.67^{b}	1424.40^{ab}	1475.50^{ab}	1533.60^{a}	78.69
Weight gain (g)	391.17^{b}	516.00^{a}	471.25^{a}	534.40^{a}	39.09
Feed intake (g)	2953.00	2990.60	2737.50	2994.20	26.17
Feed conversion ratio	7.84^{b}	5.97^{a}	6.10^{a}	5.69^{a}	0.51
Feed cost (₦/kg)	101.84	103.35	104.86	106.37	NA
Feed cost per kg gain (₦/kg)	798.43^{c}	617.00^{a}	639.65^{b}	605.25^{a}	10.60
Mortality (%)	0.00	3.33	3.33	3.33	2.60

^{abc} Means with different superscripts along the same row are significantly different ($p < 0.05$)
SEM: standard error of means, NA: Not analyzed.

Table 3:Carcass characteristics of growing rabbits fed diets supplemented with garlic(Allium sativum)

	Levels of Allium sativum (%)				
Parameters	**0.00**	**0.20**	**0.40**	**0.60**	**SEM**
Live weight (g)	1334.67^{b}	1424.40^{ab}	1475.50^{ab}	1533.60^{a}	58.27
Dressed weight (g)	884.17.00^{c}	924.00^{c}	975.00^{b}	1033.10^{a}	37.83
Dressing %	66.25	64.87	66.07	67.36	2.09
Fur (%)	7.48^{ab}	7.07^{b}	8.20^{a}	7.50^{ab}	0.46
Thoracic cavity (%)	5.96	6.39	5.80	6.27	0.53
Thigh (%)	37.97^{b}	39.96^{a}	37.88^{b}	38.96^{ab}	0.99
Shoulder (%)	18.89^{c}	19.21^{bc}	21.64^{a}	19.75^{b}	0.32
Rack (%)	17.55^{a}	16.65^{ab}	16.21^{b}	16.44^{b}	0.47
Loin (%)	24.70	23.24	23.83	24.18	1.11
Lung (%)	0.82^{ab}	1.10^{a}	0.97^{ab}	0.75^{b}	0.14
Kidney (%)	0.60^{b}	0.64 ^{b}	0.66^{b}	1.02^{a}	0.07
Heart (%)	0.17^{c}	0.25^{a}	0.19^{b}	0.15^{d}	0.01
Liver (%)	2.96^{a}	2.66^{b}	2.67^{b}	2.52^{b}	0.11
Intestine (%)	13.40	14.15	13.03	13.83	1.09

^{abc}Means with different superscripts along the same row are significantly different ($p < 0.05$).
SEM: standard error of means

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