EFFECT OF GARLIC (*ALLIUM SATIVUM*), SYNBIOTIC, ORGANIC ACIDIFIER AND ANTIBIOTICS ON GROWTH PERFORMANCE AND FAECAL MICROBIAL COUNT IN PULLETS

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ABSTRACT
A total of 240 point of cage (12 weeks old) Isa brown pullets were divided into 5 treatments in a completely randomized Design (CRD), and each treatment was further sub-grouped into 4 replicates consisting of 12 birds for 8 weeks. The dietary treatments were; control, basal diet + garlic powder, basal diet + synbiotic powder, basal diet + organic acidifier, basal diet + antibiotic. Feed and water were supplied ad libitum. Data generated were subjected to one-way Analysis of Variance (ANOVA). Feed intake of birds on organic acid and synbiotic were significantly ($p<0.05$) higher than those on garlic. Feed intake record for organic acidifier and synbiotic was not significantly ($p>0.05$) different from that of the Control and synthetic antibiotics. No significant difference was observed for weight gain and feed conversion ratio across the treatments. The population of Pseudomonas specie (x104 cfu/ml) was significantly ($p<0.05$) reduced in birds fed diets containing synthetic antibiotics. Significantly ($p<0.05$) higher population of Pseudomonas specie (x104 cfu/ml) was recorded for the group on organic acidifier. This study concluded that garlic could reduce feed intake in pullets and synthetic antibiotic completely eradicated Pseudomonas species in the pullets.
Keywords: Weight gain, feed intake, garlic, organic acidifier, and *fmicrobialload*

INTRODUCTION

Poultry is one of the most important sources of animal protein globally. Increasing demand and consumption of chicken meat and eggs has therefore increased intensive poultry production, particularly in developing countries, including Nigeria. Poultry farming has however been threatened by high cost of production and microbial infections. Some disease-causing microbes in poultry include *Salmonella, Escherichia coli (E. coli), Clostridium* and *Eimeria* e.t.c.

Antibiotics have always been used for treatment and protection of the animal bodies against diseases and as growth promoter in poultry feed to produce more protein (Revolledo and Ferreira, 2010). Antibiotic resistant microorganisms can be transmitted through oral and non-oral routes which lead to ineffectiveness of many types of antibiotics (Abujradah *et al*., 2018). Thus, various alternative feeding strategies are being incorporated into poultry diets to improve health of the birds, to eliminate antibiotic resistance, and enhance growth performance.

Garlic (*Allium sativum*) are natural feed additives which has different properties such as antimicrobial, immunostimulant, reducer of fat, cholesterol (Jarriyawattanachaikul, *et al*., 2016).

Manipulation of the gut micro-biota by supplementation of prebiotics and probiotics have shown promising results in controlling bacterial infections in poultry (Morshedi *et al.,* 2020).

It has been reported that acidifier supplementation in chickens results in decreased colonization of pathogenic bacteria within the intestines (Dittoe *et al*, 2018).

Thus, this study is carried out to assess the effect of garlic, symbiotic, and organic acidifier on growth performance and faecal microbial count of growing hens.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Poultry Unit of Institute of Food Security, Environmental Resources and Agricultural Research (IFSERAR) Farm, Federal University of Agriculture, Abeokuta (FUNAAB), Ogun State, Nigeria.

Experimental procedure

Fresh Garlic *(allium sativum)* was sourced from open market in Abeokuta metropolis. Garlic cloves were minced and oven dried until a constant weight and was then grounded into powder and included in the basal diet. Synbiotic powder, organic acidifier powder and antibiotics powder were bought from a reputable veterinary pharmacy. Garlic powder was mixed with the feed at 3g per kg feed. Synbiotic powder (Innovad Lummance), organic acid powder (Formycine Gold Px) and antibiotics powder (Keproceryl) were used according to the manufacturer's recommended doses.

Experimental birds and management

A total of 240 point of cage (12 weeks old) Isa brown pullets were bought from a reputable farm for the research. The birds were allowed to acclimatize for two weeks before subjecting them to experimental diets. The birds were assigned to 5 treatments. Each treatment was further sub-grouped into 4 replicates consisting of 12 birds each, in a Completely Randomized Design. The treatments are as follows: Control diet, Basal diet + Garlic powder. Basal diet + Synbiotic powder, Basal diet + Organic acidifier powder and Basal diet + Synthetic antibiotic. The composition of the basal diet is shown in Table 1.

Table1: Gross composition (%) of diets

Ingredients	**Growers (Kg)**
Maize	42.00
Soybean Meal	5.00
Fish Meal	-
Groundnut cake	7.30
Palm Kernel Cake	15.00
Wheat Offal	26.00
Bone Meal	2.00
Oyster Shell	2.00
Lysine	0.10
Methionine	0.10
Vit/Min Premix	0.25
Salt (NaCl)	0.25
Total	100.00
Determined analysis (%)	
Crude Protein	15.58
Crude Fibre	5.47
Ether Extract	4.08
Ash	3.60
Calcium	1.35
Phosphorus	0.37
Lysine	0.63
Methionine	0.36
Energy (Kcal/Kg)	2,477.55

Growth performance parameters

The following data were collected on growth performance parameters; feed intake, weight gain, and feed conversion ratio (FCR)

$$\text{Daily feed intake} = \frac{\text{Feed supplied (g)} - \text{feed left over (g)}}{\text{Number of days}}$$

$$\text{Daily weight gain} = \frac{\text{Final weight (kg)} - \text{initial weight (kg)}}{\text{Total number of days}}$$

$$\text{Feed conversion ratio} = \frac{\text{Total Feed Intake}}{\text{Total weight gain}}$$

Faecal microbial analysis

At week 16, fresh excreta samples were collected from each replicate group. Sterile forceps was used to collect the excreta and placed into plain bottles. The samples were taken to the Parasitology

Laboratory of the College of Veterinary Medicine, Federal University of Agriculture, Abeokuta for analysis. Viable bacterial cell counting was carried out using MilesMisra and an aseptic techniques.

Statistical analysis

All data collected were subjected to Analysis of Variance (ANOVA) in a Completely Randomized Design (CRD) using Statistical Analysis Software (SAS 2012). Significant ($p<0.05$) means among variables were separated using Duncan Multiple Range Test of the software.

RESULTS

The effect of dietary inclusion of garlic, synbiotic, organic acidifier and synthetic antibiotics on growth performance characteristics of pullets is presented in Table 2. The results showed that only feed intake was significantly ($p<0.05$) influenced by the inclusion of test ingredients. The initial weight, final weight, weight gain and FCR were not significantly ($p>0.05$) different. Feed intake of birds on organic acid and synbiotic were significantly ($p<0.05$) higher than those on garlic. Feed intake record for organic acidifier and synbiotic was not significantly ($p>0.05$) different from that of the Control and synthetic antibiotics.

Table 2: Effect of diets containing garlic, synbiotic, organic acidifier and synthetic antibiotics on growth performance of pullets

Parameters	Control	Garlic	Synbiotic	Organic acidifier	Synthetic antibiotic	SEM
Initial weight (g)	858.33	859.17	859.17	859.17	857.50	0.03
Final weight (g)	1440.00	1437.50	1429.17	1415.00	1425.00	0.08
Weight gain (g)	13.58	13.84	13.77	13.57	13.22	0.17
Feed intake (g)	123.81^{ab}	121.33^{b}	125.10^{a}	124.41^{a}	123.37^{ab}	0.46
Feed conversion ratio	8.97	8.85	9.24	9.44	9.15	0.12

$^{a,b;}$ Means bearing different superscripts in a row differ significantly ($P<0.05$)
SEM= Standard Error of Mean.

Table 3 shows the effect of dietary inclusion of garlic powder, synbiotic powder, organic acidifier and synthetic antibiotics on fecal microbial count of layers. Only *Pseudomonas specie* (x10^4 cfu/mL) amongst the population of each organisms identified showed significant ($P<0.05$) differences. The population of *Pseudomonas specie* (x10^4 cfu/mL) was significantly ($p<0.05$) reduced in birds fed diets containing synthetic antibiotics. Significantly ($p<0.05$) higher population of *Pseudomonas specie* (x10^4 cfu/mL) was recorded for the group on organic acidifier similar to values obtained for the control, garlic and synbiotic groups. *Bacillus* (x10^4 cfu/mL), *Streptococcus faecalis* (x10^4 cfu/mL), and *Escherichia coli* (x10^4 cfu/mL) did not show any significant ($P>0.05$) differences across the diets.

Table 3: Effect of diets containing garlic, synbiotic, organic acidifier and synthetic antibiotics on fecal microbial count of egg-type chickens

Organisms (x10^4 cfu/ml)	Control	Garlic	Synbiotic	Organic acidifier	Synthetic antibiotic	SEM
All bacteria	1.15	1.30	1.10	1.75	0.95	0.13
Pseudomonas species	0.10^{ab}	0.30^{ab}	0.40^{ab}	0.50^{a}	0.00^{b}	0.07
Escherichia coli	0.75	0.60	0.40	0.70	0.55	0.09
Streptococcus faecalis	0.10	0.05	0.10	0.25	0.20	0.03
Bacillus specie	0.20	0.35	0.20	0.30	0.20	0.06

$^{a,b;}$ Means bearing different superscripts in a row differ significantly ($P<0.05$)
SEM= Standard Error of Mean.

DISCUSSION

This study shows a significantly high feed intake in birds fed synbiotic based diet. This is in agreement with Falaki *et al.*, (2011); Naseri *et al*., (2012); Houshmand *et al*., (2012) who also had an improved growth performance and feed intake in chickens fed diets supplemented with synbiotic. Significant increase in body weight gain and less often in feed conversion has been reported from

some studies with organic acids in broiler chicken fed with a blend of propionic and fumaric acid Lückstädt *et al.,* (2004). Organic acidifier in this study improved intake of feed.

Garlic powder can eliminate pathogenic microbes and improve body health which can finally increase the growth and feed intake Abujradah *et al.,* (2018). Hanieh *et al.,* (2010) reported that dietary garlic has a stimulatory effect on antibody production against gram-negative bacterial antigen in White Leghorn chickens.

This study highlights the effects of garlic, synbiotic, organic acid on the faecal microbial count of layers. The improved performance of the birds might be due to the reduced population of pathogenic bacteria and the increased number of beneficial bacteria by supplementation of garlic, synbiotic, organic acid in the diet. Reduced population of *Pseudomonas species* observed in synthetic antibiotic treatment in the present study is an indication of the bactericidal function of synthetic antibiotics. The presence of these bacteria is alarming in poultry industries since the bacteria may be able to produce disease especially when birds are immunologically suppressed due to severe stress conditions. The control diet had a similar reduced population of microbial *species* compared to other diet groups. This means that these species can be handled by the immune system of the birds with or without dietary supplementation. Synbiotic have been reported to stimulate a protective immune response and improve resistance to microbial pathogens in broiler chickens and laying hens Lowry *et al.*, (2005), Zarei *et al.*, (2011). Thus, the results obtained from this study indicate that the dietary inclusion of the garlic, synbiotic, organic acid could reduce the stressful effects and stimulate the immune response of laying hens throughout the experimental period.

CONCLUSION

Based on the results obtained from the present study, it can be concluded that;

Garlic reduced ($p<0.05$) feed intake in pullets. Synthetic antibiotic completely eradicated *Pseudomonas species* in the pullets while Organic acidifier increased *Pseudomonas specie* in pullets.

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Monogastric production and nutrition (Oral mode of Presentation)