EFFECT OF NATURAL AND SYNTHETIC FEED ADDITIVES ON LAYING PERFORMANCE OF LAYERS AT EARLY AND MID LAYING PHASE

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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, and each treatment was further sub-grouped into 4 replicates consisting of 12 birds. The experiment lasted for 8 weeks. The dietary treatments were; (T1) control, basal diet + garlic powder (3g/kg feed) (T2), basal diet + symbiotic powder (0.25g/kg feed) (T3), basal diet + organic acidifier (1g/kg feed) (T4), basal diet + synthetic antibiotic (T5). Data on Age at first lay and Body weight of hen at first lay were obtained. The Henday, Egg mass, and Feed per kilogram egg were calculated. During the early laying phase (18-30 weeks), hens in treatments T4 (96.23g) and T5 (97.50g) showed significantly lower feed intake ($p<0.05$) compared to T1 (99.08g), which had the highest feed intake. Additionally, T3 (43.65g) produced the heaviest first eggs, while T5 (37.63g) produced the smallest. The average egg weight of T2 (47.11g) was significantly higher ($p<0.05$) than T4 (50.46g). However, during the mid-laying phase (30-42 weeks), no significant differences ($p>0.05$) were observed in the laying performance parameters. In conclusion, T2 recorded the best egg weight of the dietary groups while T4 had the least egg weight.
Keywords: Egg-weight, feed intake, garlic, organic acidifier, and hens

INTRODUCTION

Antibiotics have many useful uses, but because of increased resistance, there is rising worry over their use (Tiwari *et al*., 2014). "Phytogenic feed additives" are natural therapeutic items made from herbs and spices that are used to improve the nutritional status of animals and poultry (Windisch *et al.,* 2008). To enhance nutrient digestibility, lower the risk of gastrointestinal infections, enhance the overall meat quality, phytogenic feed additives are incorporated into chicken feed to optimize gut quality of health and function (Athanasiadou *et al*., 2007).

Extensive research has unveiled the numerous biological benefits of garlic, which boasts an impressive array of properties, including antibacterial, anti-inflammatory, and antioxidant effects. Additionally, garlic has shown to have anti-diabetic, anti-mutagenic, and anti-carcinogenic characteristics, as well as immune-modulating capabilities (Kim, 2016). Furthermore, studies have demonstrated that synbiotics, which combine probiotics and prebiotics, can significantly enhance human and animal health (Awad *et al.,* 2009; Markowiak and Slizewska, 2017).

To combat bacterial infections of the intestines, acidifiers reduces the pH of the cytoplasm and break the cell membranes of invading bacteria (Hedayati, 2014). Scientific research has shown that some organic acids, including citric, formic, and lactic acid, together with their salts, can inhibit the growth of dangerous microbes in the reproductive and digestive systems of chickens (Park *et al.,* 2009).

This study aimed to investigate the impact of garlic, symbiotic, and organic acidifier on the laying performance of layer hens.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Poultry Unit of the Institute of Food Security, Environmental Resources and Agricultural Research (IFSERAR) Farm, located at the 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 finely minced and oven-dried at 70℃ to achieve a stable weight. The dried garlic was subsequently ground into a powder and incorporated into 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 sum of 240 point of cage (12 weeks old) Isa brown pullets used for the research was bought from a credible farm. The pullets were allowed to acclimatize for two weeks before subjecting them to experimental diets and were randomly allocated to five treatment groups, with each treatment further divided into four replicates of 12 birds each, following a Completely Randomized Design (CRD). The five treatments were as follows: Control diet, Basal diet + Garlic powder. Basal diet + Synbiotic powder, Basal diet + Organic acidifier powder and Basal diet + Synthetic antibiotic. The nutritional composition of the basal diet is presented below.

Table1: Gross composition (%) of basal diet

Ingredients	Growers (Kg)
Maize	42.00
Soybean Meal	5.00
Fish Meal	-
Groundnut cake	7.30
PKC	15.00
W/O	26.00
B/M	2.00
O/S	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

PKC= Palm Kernel Cake, W/O= Wheat Offal, B/M= Bone Meal, O/S= Oyster Shell, Oyster Shell

Egg production parameters at point of lay

Age at first lay: the period of time between hatching and the first egg's laying date.

Hen's body weight at first lay: it is the weight of all live pullets divided by the number of pullets in each group.

Egg production performance

Egg collection was performed manually at 2:00 p.m. daily, with the amount and weight of eggs noted. Egg weight was measured using an electronic scale. Fresh feed, incorporating the respective treatments, was provided daily. Feed intake was evaluated weekly by measuring leftover feed and subtracting it from the total feed offered. Egg production percentage was determined based on hen-day egg production.

I. Henday egg production: is the division of the daily sum of eggs laid by daily total number of live birds.
II. Egg mass: Determined by multiplying the average weight of an egg by the Henday factor.
III. Feed per kilogram egg: is the division of average feed consumed by average egg weight.

Statistical analysis

Utilizing analysis of variance within a completely randomized design framework, data analysis was carried out using Statistical Analysis Software (SAS 2012). The software's Duncan Multiple Range Test, was used to identify means that differed significantly ($p<0.05$).

RESULTS AND DISCUSSION

Table 2 shows the effect of dietary inclusion of garlic, synbiotic, organic acidifier and synthetic antibiotics on laying performance characteristics of layers at early stage of laying (18-30weeks). Hens on T1 recorded significantly ($P<0.05$) highest feed intake (99.08g) while T4 (96.23g) and T5 (97.50g) had significantly ($P<0.05$) lowest feed intake. T3 (43.65g) had significantly ($P<0.05$) heaviest weight of first egg was while it was smallest in T5 (37.63). Hens in T2 (50.46g) also had the significantly ($P<0.05$) heaviest egg weight among the diet groups,

while T4 (47.11g) had the smallest weight. However, the values recorded for T2 was statistically similar (P<0.05) to that of T1 (49.29), T3 (49.57g) and T5 (48.80g). The feed/kg hen, Egg mass, Henday, Age at first lay and Weight of hen at first lay showed no significant differences (P>0.05) among the treatments only feed intake was significantly (p<0.05) influenced by the inclusion of test ingredients.

Table 2: Effect of diets containing garlic, synbiotic, organic acidifier and synthetic ntibiotics on laying performance of egg-type chickens at early stage of laying (18-30weeks)

Parameters	Control	Garlic	Synbiotic	Organic Acidifier	Antibiotics	SEM
Age at 1st lay (days)	146.25	151.75	147.50	147.75	146.50	0.95
Feed Intake (g)	99.08^{a}	98.24^{ab}	98.39^{ab}	96.23^{c}	97.50^{bc}	0.28
Weight at 1st 1ay (g)	1435.00	1437.50	1422.50	1420.00	1432.50	5.73
Weight of 1st egg (g)	43.15^{ab}	43.05^{ab}	43.65^{a}	38.15^{ab}	37.63^{b}	0.94
Egg weight (g)	49.29^{ab}	50.46^{a}	49.57^{ab}	47.11^{b}	48.80^{ab}	0.47
Hen/day (%)	67.47	66.32	65.06	67.60	64.93	0.64
Egg mass (g)	33.24	33.44	32.23	31.85	31.67	0.36
Feed/kg egg	2.99	2.94	3.06	3.03	3.09	0.03

$^{a,b:}$ Means with different superscripts within a row are significantly different (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 laying performance of layers mid stage of laying (30-42weeks). All parameters observed showed no significance differences (P<0.05).

Table 3: Effect of diets containing garlic, synbiotic, organic acidifier and synthetic antibiotics on Egg Quality of egg-type chickens at mid stage of laying (30-42weeks)

Parameters	Control	Garlic	Synbiotic	Organic Acidifier	Synthetic Antibiotics	SEM
Feed intake (g)	119.74	120.71	121.06	120.46	120.68	0.21
Egg weight (g)	54.66	54.80	54.08	52.36	53.32	0.42
Henday (%)	84.58	86.18	84.40	87.73	85.31	0.57
Egg mass (g)	46.21	47.22	45.64	45.93	45.46	0.33
Feed/kg egg	2.60	2.56	2.65	2.63	2.66	0.02

In this study, the egg weight and feed intake were significantly influenced (p<0.05) by the experimental diets at 18-30 weeks of age, while the feed intake of laying hens were higher in all the treatment groups than the control at 30–42 weeks of age. This shows that the dietary inclusion of garlic, synbiotic, organic acidifier and synthetic antibiotics improved the consumption rate of the birds. Several studies have shown that adding synbiotics to poultry feeds can increase the amount of feed that laying hens and broiler chicks consume (Abdel-Raheem and Abd-Allah, 2011). According to Cross *et al*. (2007), there has been a suggestion that the reason for the increased feed intake could be the synbiotic's capacity to increase laying hens' appetite due to their actions in the gut. There are, however, differing results. Some studies have found no effect by adding synbiotics to diets and the amount of feed consumed by broiler chicks or laying hens (Abdelqader *et al*., 2013; Mohebbifar *et al*., 2013). According to Abdelqader *et al.* (2013), adding *Bacillus subtilis* and inulin, either separately or together, to hen diets greatly increased feed/kg feed. This finding contradicts the findings of this investigation, as the experimental diets had no discernible effect on the feed/kg feed, egg mass, or henday of the laying hens in this study at either 20–32 or 32–44 weeks of age.

CONCLUSION

Garlic recorded the best egg weight of the dietary groups. Organic acidifier had the least egg weight at early laying phase (18-30weeks). No significant observation was made at the second laying phase (32-44 weeks). Therefore, Garlic is recommended for egg production performance of layers at 3g per kg feed.

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