

VARYING LEVELS OF DIETARY GARLIC (*Allium sativum*) POWDER MEAL ON EXTERNAL EGG QUALITY CHARACTERISTICS OF LAYING BIRDS

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ABSTRACT

This study examined the effects of garlic powder meal on the external quality of egg of Bovan Nera and ISA Brown. A total of 240 pullets (120 Bovan Nera and 120 ISA Brown) of 20 weeks old, were used in the experiment. The laying birds were randomly assigned to one of five dietary treatments: T1 (control, 0.00% garlic powder), T2 (0.75% garlic powder), T3 (1.5% garlic powder), T4 (2.25% garlic powder), and T5 (3.00% garlic powder). Each treatment was replicated four times with six birds per replicate. The study employed a Completely Randomized Design (RCBD), with five garlic inclusion levels as treatments, each replicate had eight birds, replicated six times and a total of forty-eight birds per treatment. Birds were raised in a deep litter cage and each pullet in each group were fed layers' mash daily and supply of water ad libitum for 16 weeks (April – July, 2020). Eggs were collected daily and recorded for each strain pullets. Two eggs were selected at random from each replicate, making a total of 40 eggs for both strains per week and were used for external egg assessment. The external egg quality characteristics (egg weight, egg volume and shell weight) were significantly ($P < 0.05$) influenced by dietary treatments. Bovan Nera pullets on dietary treatments T2 (0.75%) garlic inclusion were higher in egg weight, egg volume, egg width and egg length. The effect of garlic powder on external egg quality parameters showed that laying pullets fed dietary garlic powder T2 (0.75%) had the highest external egg quality such as egg weight, egg length and egg volume. Therefore, recommended 0.75% of garlic powder meal in laying birds feed.

Keywords: Bovan nera, Egg weight, Egg length, Egg volume, Garlic meal

INTRODUCTION

Over the past twenty years, Nigeria has experienced a dramatic population surge, which has significantly increased the demand for food (Moseri and Belonwu, 2023). However, the availability of high-quality food items such as meat, eggs, and milk has become scarce due to the economic challenges faced by many Nigerians. According to Moseri and Belonwu (2023), this situation is marked not only by a steep rise in food demand but also by soaring costs, making these essentials out of reach for many. In response, both the government and individuals are making concerted efforts to engage in farming and, more specifically, animal production. In Nigeria, commercial poultry farming particularly came into being, soon after the Nigerian civil war in 1970 (Oruseibo, 2002). Poultry products contribute immensely to the protein intake of the population. According to Odebunmi *et al.* (2009), the rapid growth of human and livestock population, which is creating increasing need for food and feed in the less developed countries, demand that alternative feed sources must be identified and evaluated. Therefore, it is essential to investigate alternative methods of natural spices with antimicrobial properties that can boost poultry industrial growth with minimal expense could serve as valuable substitutes for conventional, expensive synthetic antibiotics (Ajaji and Ejiofor, 2001). This study examined the effects of different levels of dietary garlic (*Allium sativum*) powder on the external egg quality characteristics of laying birds.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm of the Delta State University, Asaba Campus, Asaba, Nigeria. The farm location is on longitude 6°49'E of the Greenwich meridian and latitude 6°14'N of the equator. It has an annual rainfall range of 1500mm to 3000mm, temperature range of 27.5°C to 30.9°C and relative humidity of 77.2% to 80% (Asaba Meteorological Service Centre, 2019).

Poultry house and housing preparation

The poultry house was fully covered with wire netting for good ventilation and it was built with dwarf walls. The laying birds were managed on deep litter system. The poultry house was kept in high hygienic and good sanitary conditions throughout the experiment

Preparation of test ingredients

Fresh garlic bulbs (*Allium sativum*) were procured from the Ogbeogonogo local market in Asaba. They were air-dried under room temperature. The garlic bulbs were separated into cloves, peeled and sliced with hands into flakes form of 3-4mm thick thereby increasing the surface area for faster drying up to 5-6% moisture content. This was then sun-dried, and milled using a micro-miller blender. The resultant dried garlic meal was stored in air-tight containers prior to the commencement of the experiment

Experimental design

The experiment was a Each treatment was replicated four times with six birds per replicate. The study employed a Completely Randomized Design (CRD), with five garlic inclusion levels as treatments, each replicate had eight birds, replicated six times and a total of fourty eight birds per treatment of Bova Nera with dietary treatments of garlic inclusion at five levels (0.00%, 0.75%, 1.50%, 2.25% and 3.00%)

Experimental diets

Experimental diets were formulated according to A.O.A.C (2000) into five dietary treatments as follows: (Treatment 1 (T1) which served as the control contained 0.00%garlic meal (MGM), (Treatment 2) (T2) contained (0.75%) milled garlic meal (MGM), (Treatment 3) (T3) had 1.5% MGM), (Treatment 4) (T4) contained2.25% MGM while diets 5 (Treatment) (T5) had 3.00% MGM for the layer pullets.

Table 1: Composition of laying pullets experimental diets

Ingredients	T1	T2	T3	T4	T5
Maize	57.00	56.90	56.20	56.25	54.5
Milled Garlic Meal	0.00	0.75	1.5	2.25	3.00
Soya Bean Meal	16.90	16.25	16.2	15.45	16.40
Fish Meal	4.00	4.00	4.00	4.00	4.00
Wheat Offal	10.50	10.50	10.50	10.50	10.50
Rice Offal	1.50	1.50	1.50	1.50	1.50
Oyster	6.50	6.50	6.50	6.50	6.50
Bone Meal	3.00	3.00	3.00	3.00	3.00
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
Common Salt	0.20	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00	100.00
Calculated Crude Protein (%)					
ME(KCAL/KG)	2581.23	2545.09	2509.16	2503.65	2560.05

Data collection

Data were collected and recorded on replicate basis for a period of sixteen (16) weeks of the egg external quality characteristics parameters taken; were egg weight (g), length and width in diameter (cm), egg shell weight (g) and shell thickness (mm) were collected. Eggs collected from each treatment were randomly selected on the basis of weight, for egg external quality parameters. The eggs were properly cleaned and weighed with sensitive analytical balance to the nearest 0.01cm. The egg length and width were determined with Vernier Calliper while the egg volume was determined using a measuring cylinder. Shell weight was determined using electronic balance to the nearest 0.1g. Shell thickness was determined with Micrometre Screw Gauge, while shell samples from the broad, middle and narrow portions of the eggs were measured for shell thickness and the mean was calculated as,

$$\frac{\text{Apex} + \text{Middle} + \text{Base}}{3}$$

Statistical analysis

The collected data were subjected to analysis using the SAS (2003) package. Differences between treatment means were then assessed using Duncan's multiple range test (DMRT)

RESULTS AND DISCUSSION

The effect of garlic dietary treatment on the external egg quality of laying birds is presented in Table 2. There was no significantly ($P>0.05$) different in egg length, egg width and shell thickness. Egg weight, egg volume and shell weight were significantly ($P<0.05$) influence by dietary treatment. Birds fed Dietary treatment (T2) (0.75%) significantly increase in all the external egg quality followed by pullets fed dietary treatment T3 (1.5%) and pullets which consumed dietary treatment is (3.0%) had the least ($P<0.05$) external egg quality characteristics.

Eggs are an inexpensive source of high-quality protein, essential vitamins and minerals that are needed for a healthy diet and healthy life compared to other animal sources. Thus, improvement in egg quality is of paramount important in the field of production and management (Muhammed *et al.*, 2019) noted that egg weight increase when laying hens were fed 5g/kg and 10g/kg garlic powder. Canogullari *et al.*, (2010) also reported that egg production increased significantly ($P<0.05$) by adding 1% garlic powder in the feed of laying hens. The present study showed increase in egg weight of laying pullet. Fed garlic dietary treatment T2 (0.75) but decreases with increased level of garlic T3 (1.5%), T4 (2.25) and T5 (3.0%) respectively. This finding is supported with the report

of Omer *et al.*, (2019). Sakine and Onbasitar (2006) that egg weight increases with dietary garlic powder supplementation. In contrast Khan *et al.*, (2008), Safaa (2007) reported that egg weight was not affected by 0, 2, 6 or 8% garlic powder.

Table 2: Effect of garlic dietary treatments on external egg characteristics of laying birds

Parameters	T1(0.0%)	T2(0.75%)	T3(1.5%)	T4 (2.25%)	T5(3.00%)
Egg weight (g)	54.70±0.53 ^b	57.82±0.62 ^a	55.89±0.51 ^b	54.91±0.53 ^b	54.35±0.47 ^b
Egg Length (cm)	4.32±0.09	4.41±0.09	4.36±0.84	4.29±0.08	4.33±0.09 ^{NS}
Egg width (cm)	3.10 ±0.09	3.16 ±0.09	3.08 ±0.08	3.07±0.09	3.08±0.09 ^{NS}
Egg Volume (ml)	50.06 ±0.05 ^{ab}	51.96 ±0.59 ^a	50.91±0.52 ^{ab}	49.92±0.56 ^b	49.72±0.50 ^b
Shell Weight (g)	5.20 ±0.07 ^b	5.54 ±0.07 ^a	5.42±0.08 ^{ab}	5.34±0.07 ^{ab}	4.95±0.08 ^{bc}
Shell Thickness (mm)	0.54±0.01	0.56±0.01	0.55±0.01	0.56 ±0.01	0.54±0.01 ^{NS}

a, b, c means on the same row having different superscripts are significantly different (P<0.05)

NS means not significantly different (P>0.05)

CONCLUSION

The impact of garlic powder on external egg quality parameters revealed that laying pullets fed a diet with 0.75% garlic powder (T2) exhibited the best external egg quality, including higher egg weight, egg volume, and shell weight. Therefore, it is recommended to include 0.75% garlic powder in the feed for laying pullets in the study area

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