International Journal of Agriculture, Environment and Bioresearch

Vol. 09, No. 04; 2024

ISSN: 2456-8643

RESPONSE OF NOILER CHICKS TO DIETS CONTAINING VARYING DIETARY LEVELS OF LYSOLECITHIN

Ani, Augustine Ogbonna[1]., Onodugo, Mathew Onyeka[1]., Udeh, Valentine Chukwuebuka[1] and *Torhemen, Lynda Ngodoo[2]

[1]Department of Animal Science, University of Nigeria, Nsukka, Nigeria

[2]Department of Animal Nutrition, University of Agriculture Makurdi, Nigeria

https://doi.org/10.35410/IJAEB.2024.5920

ABSTRACT

The response of noiler chicks to diets containing varying dietary levels of lysolecithin was investigated. Three hundred (300) day-old noiler chicks were used for the study. The birds were randomly allotted to five treatment groups of 60 birds each, and assigned to five treatments using a completely randomized design (CRD). The treatments were designated as follows: Treatment 1,0g lysoecithin; Treatment 2, 100g lysolecithin/100kg of feed; Treatment 3, 200g lysolecithin/100kg of feed; Treatment 4, 300g lysolecithin/100kg of feed and Treatment 5, 400g lysolecithin/100kg of feed. Each treatment group was replicated three times with 20 birds per replicate. Feed and water were provided to the birds ad libitum. Data were collected on growth parameters: live weights, weight gain, feed intake, feed conversion ratio and protein efficiency ratio, digestibility coefficients and oxidative status of birds. Results showed that significant ($p < 0.05$) differences existed among treatments in average daily feed intake (ADFI), total feed intake (TFI), daily protein intake (DPI), feed cost per kg, cost of daily feed intake, cost of total feed intake and feed cost per kg gain. Significant differences ($p < 0.05$) also existed among the dietary treatments in apparent retention (% of intake) of dry matter (DM) and in crude fiber digestibility coefficient. Supplementation of the noiler diets with lysolecithin had significant effect ($p < 0.05$) on glutathione reductase (GR), while superoxide dismutase (SOD), catalase (CAT), malondialdehyde (MDA), glutathione peroxidase (GPx) and glutathione (GSH) were not significantly ($p > 0.05$) affected by treatments. It was concluded that 100g of lysolecithin can be included in 100kg of feed to enhance feed intake, feed cost per kg gain and DM retention.

Keywords: Noiler Chicks, Performance, Digestibility Coefficients, Lysolecithin, Diets.

1. INTRODUCTION

The Nigerian poultry industry has undergone a remarkable transformation and poultry production has become increasingly popular in Nigeria due to the many advantages connected to it (Ewubare and Ozar, 2018). Nigeria population is estimated to be 226,700,784 with an annual growth rate of 2.78% (WorldoMeter, 2024). The poultry sector plays a crucial role in addressing the deficiency of protein among the Nigerian populace by offering meat and egg products that are rich in protein and valuable nutrients, all at a more affordable cost compared to alternative sources of animal meat protein (Abd El-Hack et al., 2022). In traditional nutritional practices, producers typically opt for the least-cost feed formulations to effectively address the challenge of high feed prices. However, formulating poultry diets using the least-cost approach is not as straightforward as it is for ruminants, primarily due to variations in the availability of raw materials for poultry. While there are programs designed to efficiently target reduced feed costs, a significant drawback is the frequent failure of these programs to maintain a proper balance between lower feed expenses and acceptable performance levels (Banrie, 2013). According to Iji et al. (2017) and Tanimo et al. (2020), the prevailing trend in animal nutrition is to provide easily accessible substitutes that are less expensive to produce, less competitive, and beneficial to poultry health. Production of animals, both ruminant and monogastric, depend on safe and nutritious feed and supplements to provide them with the nutrients they need. Animals' ability to absorb nutrients will be correlated with their ability to digest raw materials; however, a variety of obstacles and stresses can impact both of these processes. With the prohibition of antibiotic growth promoters (AGPs), various natural antibiotic alternatives such as feed additives have gained popularity in the poultry industry. These additives can be easily blended with other feed ingredients, leaving no tissue residues (Abd El-Hack et al., 2022). The effectiveness of any feed additive is assessed based on its capacity to enhance the utilization of protein, amino acids, and energy. The relationship between digestibility and the concentration of the provided feed is not linear, indicating that a highly nutritious diet may not necessarily have high digestibility. Nutrient digestibility and utilization are influenced by various factors. For instance, the microbial status of the gastrointestinal tract, the presence of bacterial challenges, and the accessibility of nutrients for absorption vary widely. By regulating gut microflora, feed additives hold significant potential to enhance the digestibility of nutrients (Banrie, 2013). The feed additive being explored in the present study is lysolecithin. Lysolecithin, a component of lysoforte, produced from lecithin acts as an efficient emulsifier. It can improve poultry growth, reproduction, and carcass quality by enhancing nutrient digestion and absorption, as well as reducing their mortality (Metwally, 2020). The Noiler chicken breed emerges as a hybrid resulting from the successful crossbreeding of a male broiler with an exotic pullet. Noilers exhibit accelerated growth, coupled with superior egg-laying and meat production capabilities (Deji-folutile, 2022). Against this backdrop, the present study was therefore designed to investigate the response of noiler chicks to diets containing varying dietary levels of lysolecithin.

.

2. MATERIALS AND METHODS

2.1 Location and duration of the Study

The study which lasted nine weeks was conducted at the Poultry Unit of the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. All experimental procedures in the present study were performed according to the guidelines for the use of animals in biomedical research as described by the Ethical Research Committee of the University of Nigeria, Nsukka.

2.2 Experimental materials and diet

Maize, soybean meal, palm kernel cake and other feed ingredients were used for the study. Broiler starter diet was formulated and the test material added as a supplement. The composition of the basal diets (no lysolecithin) is shown in Table 1.

Table 1: Percentage composition starter broiler diet

Ingredients	Percentage (%)
Maize	41.7
Soybean meal	31. 00
Palm kernel cake	14.80
Local fish meal	5.00
Bone meal	4.00
Limestone	2.5
*Vitamin/mineral premix	0.25
Methionine	0.25
Lysine	0.25
Iodized salt	0.25
Total	100
Calculated compositions:	
Crude protein (%)	22.04
Energy (Mcal/KgME)	2.50
Crude fibre(%)	5.00

*Vit A – 10,000.00 iu., D_3-2,000 iu., B_1-0.75g., B_2-5g., Nicotinic acid – 25g., Calcium pantothenate 12.5g., B_12-0.015g., K_3-2.5g., E-25g., Biotin – 0.050g., Folic acid –1g., Manganese 64g., Choline chloride 250g., Cobalt-0.8g., Copper 8g., Manganese 64g., Iron –32G., Zn-40g., Iodine-0.8g., Flavomycin-100g., Spiramycin 5g., Dl-methionie-50g, Selenium 0.6g., Lysine 120g., BA

2.3 Experimental animals and management

Three hundred (300) day-old noiler chicks were used for the study. The birds were randomly allotted to five treatment groups of 60 birds each, and assigned to five treatments using a completely randomized design (CRD). The treatments were designated as follows: Treatment 1,0g lysolecithin; Treatment 2, 100g lysolecithin/100kg of feed; Treatment 3, 200g lysolecithin/100kg of feed; Treatment 4, 300g lysolecithin/100kg of feed and Treatment 5, 400g lysolecithin/100kg of feed. Each treatment group was replicated three times with 20 birds per replicate. The birds in each replicate were brooded in a deep litter pen measuring 1.50m x 1.50m in the experimental poultry house. The poultry house was an open-sided one; the sides and demarcations between individual pens were covered with wire gauze. The litter material was fresh wood shavings. Heat was provided with charcoal pots placed under metal hovers. Feed and water were provided to the birds *ad libitum* while additional light was provided at night using kerosene powered lamps to enable the birds eat at night. The chicks were vaccinated against Newcastle and Gumboro diseases as and when due. The birds were also vaccinated against fowl pox disease at week 5, and at weeks 6-8, Lasota vaccine was repeated because of prevalence of Newcastle disease in the farm.

2.4 Data Collection and measurements

Body weight and feed intake were measured. Feed intake was done daily by a weigh back technique, in which feed remaining at the end of the day was subtracted from the initial feed offered to the birds. The difference between the feed offered and the leftover is considered as feed consumed. Body weight of the birds were measured and recorded on a weekly basis. Data obtained were used to calculate feed conversion ratio (FCR), average daily weight gain and protein efficiency ratio. Feed conversion ratio was calculated from these data as gramme feed consumed per gramme weight gained over the same period.

2.5 Nutrient digestibility Trial

During the last week of the feeding trial, one bird was selected from each replicate (three birds per treatment), moved to clean and disinfected metabolic cages for the evaluation of apparent retention (% of intake) of nutrients by the noiler birds. A 3-day adaptation period was allowed before the four-day data collection period. Feed intake was measured and droppings were collected per bird daily. The collected droppings were air-dried at room temperature before being ground for proximate analysis according to AOAC (2006) methods. Apparent nutrient digestibility of crude fibre, crude protein, crude fat, and dry matter were computed according to the following equation;

$$\text{Nutrient digestibility \%} = \frac{\text{Nutrient in feed} - \text{Nutrient in faeces}}{\text{Nutrient in Feed}} \times 100$$

2.6 Slaughter and collection of samples for oxidative status

On the 28th day of the experimental period, three birds were randomly selected from each treatment and feed-fasted for 8 hours. The birds were slaughtered by severing the jugular vein, scalded in warm water for a minute and de-feathered by manual plucking. Following the slaughter, breast meat samples were obtained for oxidant status and stored at 4^{o}C until the analysis was done. Breast meat (10g) was taken from each slaughtered bird and used to determine the activities of antioxidant enzymes such as superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPx). The activity of the (SOD) was assayed in the tissue homogenates at 560 nm based on the methods described by Kakkar *et al.* (1984). One unit of enzyme activity was defined as that amount of enzyme which caused 50% inhibition of nitrobluetetrazolium reduction/mg protein. Catalase activity was determined at room temperature based on the method of Aebi (1974), and the absorbance of the sample was measured at 240nm in an UV spectrophotometer. The concentration of (GPx) homogenates was measured, as described by Jollow et al. (1974). All of the enzyme activities were expressed as per mg of protein, and the tissue protein was estimated according to the method of Lowry et al. (1951)

Vol. 09, No. 04; 2024

ISSN: 2456-8643

using bovine serum albumin (BSA) as a standard. The malondialdehyde (MDA) level was analyzed with 2-TBA, monitoring the change of absorbance at 532 nm with a spectrophotometer (Jensen et al., 1997).

2.7 Proximate and Statistical Analyses: *Feed and excreta samples were assayed for proximate composition by the method of AOAC (2006).*

2.7 Statistical design and analysis: *Birds were also randomly assigned to each of the five treatments in a completely randomized design. Data collected were analyzed using one-way analyses of variance (ANOVA) for completely randomized design (CRD) using a Stat Graphic Computer Package (SPSS, 2007) Model. Significantly different means were separated using Duncan's New Multiple Range Test (Ducan, 1955) option in SPSS.*

3.RESULTS AND DISCUSSION

3.1 Result

3.1.1 Effect of Supplemental Lysolecithin at Different Levels on the Growth Performance of Noiler chicks

Table 2 shows the proximate composition of the experimental diets while data on the effect of supplemental lysolecithin at different levels on the growth performance of noiler chicks are shown in Table 3. Significant ($p < 0.05$) differences existed among treatments in average daily feed intake (ADFI), total feed intake (TFI) and daily protein intake (DPI) values. Birds in treatment 5 (diet containing 400g of lysolecithin /100kg of diet) had the least ($p < 0.05$) ADFI value (58.94g) and this was followed by that (66.52g) for treatment 2(diet containing 100g of lysolecithin /100kg of diet). Birds in treatment 1(control) had the highest ($p < 0.05$) ADFI value (76.2g) but this statistically similar to the ADFI values for birds in treatments 3 and 4(76.41g and 75.32g, respectively). Birds in treatments 2 and 5 had similar TFI values (3.73kg and 3.63kg, respectively) with birds in treatments 3 and 4(4.28kg and 4.26kg, respectively) and these were significantly ($p < 0.05$) lower than the TFI value (4.54kg) for birds in treatment1.Birds in treatments 1, 3 and 4 had similar TFI values.

Birds in treatment 5 (diet containing 400g of lysolecithin /100kg of diet) had the least ($p < 0.05$) DPI value (11.81g) and this was followed by that (13.30g) for treatment 2(diet containing 100g of lysolecithin /100kg of diet). Birds in treatment 1(control) had the highest ($p < 0.05$) DPI value (15.24g) but this statistically similar to the DPI values for birds in treatments 3 and 4(15.29g and 15.08g, respectively).

Vol. 09, No. 04; 2024

ISSN: 2456-8643

Table 2: Proximate Composition of the Experimental Diets

Lysolecithin levels(g/100kg of Diet)	0	100	200	300	400
Components/Diets	**1**	**2**	**3**	**4**	**5**
Dry matter (%)	89.93	91.00	89.70	91.00	90.50
Crude protein (%)	22.81	22.8	22.82	22.8	22.83
Ether extract (%)	2.5	2.00	2.50	1.80	4.00
Crude fibre (%)	4.50	5.50	5.00	5.50	6.00
Nitrogen-free extract (%)	57.12	58.10	57.38	58.40	54.67
Gross energy (Kcal/g)	3000.05	2993.50	3009.50	2987.80	3036.50

Table 3: Effect of supplemental lysolecithin at different levels on the growth performance of noiler chicks

Lysolecithin levels(g/100kg of Diet)	0	100	200	300	400	
Parameters/Treatments	**1**	**2**	**3**	**4**	**5**	**SEM**
Initial body weight (g)	63.08	63.74	62.5	62.99	61.38	1.01
Final body weight (g)	1223	1106	1290	1177	1097	37.37
Total weight gain(g)	1159.92	1042.26	1227.17	1114.01	1035.95	37.17
Av. daily weight gain (g)	20.71	18.61	21.91	19.9	18.5	0.66
Total Feed intake(kg)	4.54^{b}	3.73^{a}	4.28^{ab}	4.26^{ab}	3.63^{a}	0.13
Av. daily feed intake (g)	76.2^{c}	66.52^{b}	76.41^{c}	75.32^{c}	58.94^{a}	2.01
Feed conversion ratio	3.69	3.71	3.49	3.86	3.2	0.14
Daily protein intake(g)	15.24^{c}	13.30^{b}	15.29^{c}	15.08^{c}	11.81^{a}	0.4
Protein efficiency ratio	1.36	1.64	1.43	1.32	1.56	0.06

^{a,b,c,}Means on the same row with different superscripts are significantly ($P<0.05$) different.
SEM = Standard error of the mean

3.1.2 Cost implication of feeding varying dietary levels of lysolecithin to noiler birds

Table 4 shows the cost implication of feeding varying dietary levels of lysolecithin to noiler birds. There were significant differences ($p < 0.05$) among the dietary treatments in feed cost per kg, cost of daily feed intake, cost of total feed intake and feed cost per kg gain. The cost of one kg of the control diet was the least (₦350.35) and this was followed by the cost (₦570.35) of one kg of diet 2(diet containing 100g of lysolecithin /100kg of diet). The cost of one kg of diet 5 (diet containing 400g of lysolecithin /100kg of diet) was the highest (₦1230.35) and this was followed by the cost (₦1010.35) of one kg of diet 4(diet containing 300g of lysolecithin /100kg of diet). Birds in treatment1 (control) had the least cost of average daily feed intake (₦26.69) and this was followed by the cost (₦37.94) of daily feed intake of birds in treatment 2. Birds in treatments 4 and 5 had similar cost of daily feed intake values (₦76.1 and ₦72.7, respectively) and these were the highest values. Birds in treatments 4 and 5 had similar cost of total feed intake values (₦4307.5 and ₦4466.2, respectively) and these were the highest values. Birds in treatment5 had the highest costs of average daily feed intake and total feed intake values. Birds in treatments 1 and 2 had similar cost of total feed intake values (₦1591.8 and ₦2125.5, respectively) and these were the least values. Birds in treatment 3 had significantly ($p < 0.05$)

Table 4: Cost implication of feeding varying dietary levels of lysolecithin to noiler chicks

Lysolecithin levels(g/100kg of Diet)	**0**	**100**	**200**	**300**	**400**	
Parameters/Treatments	**1**	**2**	**3**	**4**	**5**	**SEM**
Feed cost per kg(₦)	350.35[a]	570.35[b]	790.35[c]	1010.35[d]	1230.35[e]	83.15
Cost of average daily feed intake(₦)	26.69[a]	37.94[b]	60.39[c]	76.1[d]	72.7[d]	5.21
Cost of total feed intake(₦)	1591.8[a]	2125.5[a]	3380.1[b]	4307.5[c]	4466.2[c]	317.81
Feed cost/kg Gain(₦)	1294[a]	2117.9[ab]	2758.3[b]	3775.3[c]	3933[c]	284.31

[a,b,c,d]Means on the same row with different superscripts are significantly ($P<0.05$) different.
SEM = Standard error of the mean

lower total feed intake value (₦3380.1) than those in treatments 4 and 5. Birds in treatment 1 had the least feed cost per kg gain value (₦1294) but it was similar to that for birds in treatment 2(₦ 2117.9). Birds in treatments 4 and 5 had similar feed cost per kg gain values (₦3775.3 and ₦3933, respectively) and these were the highest values. Birds in treatments 2 and 3 had statistically similar feed cost per kg gain values (₦ 2117.9 and ₦2758.3, respectively). Birds in treatments1 (control) and 2 had similar feed cost per kg gain values and these were significantly lower than the feed cost per kg gain values for birds in other treatments. Birds in treatment 5 had the highest feed cost per kg value. Birds in treatments 3 and 4 had similar feed cost per kg gain values.

3.1.3 Effect of supplemental lysolecithin at different levels on apparent retention (% of intake) of nutrients by noiler birds

Data on the effect of supplemental lysolecithin at different levels on apparent retention (% of intake) of nutrients by noiler birds are shown in Table 5. Significant ($p < 0.05$) differences existed among treatments in apparent retention **(**% of intake) of dry matter (DM) and in crude

Table 5: Effect of supplemental lysolecithin at different levels on apparent retention (% of intake) of nutrients by noiler chicks

Lysolecithin levels(g/100kg of Diet)	0	100	200	300	400	
Parameters/Treatments	**1**	**2**	**3**	**4**	**5**	**SEM**
Dry matter (%)	85.21^{b}	70.30^{a}	71.67^{a}	80.15^{ab}	69.82^{a}	2.19
Crude protein (%)	99.14	98.48	98.76	99.25	98.98	0.12
Crude fibre (%)	98.71^{a}	99.01^{ab}	99.94^{b}	99.15^{ab}	99.12^{ab}	0.16
Ether extract (%)	99.86	99.90	99.89	99.83	99.94	0.02
Nitrogen-free extract (%)	89.17	87.27	87.74	88.91	87.17	1.11

^{a,b,c,}Means on the same row with different superscripts are significantly (P<0.05) different.
SEM = Standard error of the mean

fibre digestibility coefficient. Birds in treatments 2, 3 and 5 had similar DM retention values (70.30%,71.67% and 69.82%, respectively) and these were significantly higher than DM retention value (85.21%) for birds in treatment1 (control). Birds in treatment 1 had statistically similar DM retention value with those in treatment4 (80.15%0. Birds in treatments 2, 3 and 5 had similar DM retention values with those in treatment 4 (diet containing 300g of lysolecithin /100kg of diet).

Birds fed diet containing 200g of lysolecithin /100kg of diet (treatment 3) had the highest crude fiber digestibility coefficient (99.94%) but this was similar to the digestibility coefficients of birds in treatments 2, 4 and 5(99.01,99.15 and 99.12%, respectively). Birds in treatment 1 had the least crude fiber digestibility coefficient (98.71%) but this was similar to the digestibility coefficients of birds in treatments 2, 4 and 5(99.01,99.15 and 99.12%, respectively).

3.1.4 Effect of Supplemental lysolecithin at Different Levels on the oxidative status of noiler chicks (Day 0-28)

Data on the effect of supplemental lysolecithin at different levels on the lipid oxidative status of noiler chick breast meat and on the anti-oxidative enzyme activity in breast meat of the noiler birds at week 4 of the experimental period are presented in Table 6. Supplementation of the noiler diets with lysolecithin had no significant ($p > 0.05$) effect on most of the parameters namely; superoxide dismutase (SOD), catalase (CAT), malondialdehyde (MDA), glutathione peroxidase (GPx) and glutathione (GSH). However dietary supplementation with lysolecithin had significant effect ($p < 0.05$) on glutathione reductase (GR). Bird in treatments 3 had the highest GR value (12.16 IU/L) and this was statistically similar to the GR values for birds in treatments 1, 2, and 5(12.08IU/L, 12.52IU/L and 12.47IU/L, respectively). Bird in

ISSN: 2456-8643

treatments 4 had the highest GR value (13.22 IU/L) and this was statistically similar to the GR values for birds in treatments 2 and 5(12.52IU/L and 12.47IU/L, respectively).

Table 6: Effect of Supplemental lysolecithin at Different Levels on the oxidative status of noiler chicks (Day 0-28)

Lysolecithin levels(g/100kg of Diet)	**0**	**100**	**200**	**300**	**400**	
Parameters/Treatments	**1**	**2**	**3**	**4**	**5**	**SEM**
SOD(IU/L)	10.37	10.16	10.78	10.11	10.44	0.14
Catalase(mg/dl)	0.56	0.52	0.59	0.58	0.55	0.04
MDA(mg/dl)	3.20	3.43	3.29	3.50	3.32	0.11
GPx(mg/dl)	7.19	7.93	7.54	7.05	7.53	0.16
GSH(mg/dl)	0.41	0.41	0.40	0.41	0.44	0.01
GR(IU/L)	12.08^{a}	12.52^{ab}	12.16^{a}	13.22^{b}	12.47^{ab}	0.14

^{a,b,}Means on the same row with different superscripts are significantly ($P<0.05$) different.
SEM = Standard error of the mean

4. DISCUSSION

4.1 Effect of Supplemental Lysolecithin at Different Levels on the Growth Performance of Noiler Birds

Result reveal that birds fed the control diet (treatment 1) had significantly higher average daily feed intake, total feed intake and daily protein intake than birds on treatment 2, 3 and 4, while bird fed treatment 5 (400g lysolecithin) had the least value for the same parameters. This can be attributed to the effect of supplementation with lysolecithin, as the level of supplementation increased in birds' diet; feed intake and daily protein intake decreased due to increased fat digestion and nutrient absorption. Lysolecithin plays a crucial role in promoting efficient fat digestion, absorption and utilization in animals, their emulsifying properties facilitate the breakdown of dietary fats into smaller droplets increasing the surface area available for enzymatic degradation by lipase (Jan, 2023). Results of this present study are in line with reports of Jan (2023) who found that lysolecithin are effective dietary emulsifiers that promote fat utilization and production performance especially in young animals, it also enables a reduction in dietary energy content without compromising animal performance. This implies that, supplementation with lysolecithin increased nutrient utilization by birds so that the least quantity of feed consumed was enough to meet the bird's requirement for maintenance and growth. Results of this study agree with reports of Adesehinwa, (2016) who stated that the amount of feed consumed by animals allowed to consume feed *ad lib* is controlled principally by the energy content of the diet, if the energy density of the diet is increased by including supplemental fat, voluntary feed consumption decreases. Similarly, (Zhang, Zhiming et al.(2022) and Zhao and Kim(2017) found that birds can regulate their energy intake by modifying their feed intake as diet energy concentration changes, and this can be used to explain the reduced feed intake. This suggest that, as Lysolecithin inclusion levels increased, dietary fat also increased thereby decreasing feed intake in the 400g supplemental Lysolecithin diets.

4.2 Cost implication of feeding varying dietary levels of lysolecithin to noiler birds

The cost implication of feeding varying dietary levels of Lysolecithin in noiler birds significantly impacted on feed cost per kg, cost of average daily feed intake, cost of total feed intake and feed cost per kg gain. Birds fed the control, (0g) Lysolecithin supplemental diet had the least cost in all cost-benefit parameters measured. This may be attributed to the extra cost of purchase of the supplemental material Lysolecithin used in the test treatments. However, birds fed 100g Lysolecithin supplementation had a significantly similar cost of total feed intake to the control and also a comparable feed cost per kg gain to the control. Result of this present study is in line with reports of Jan, (2023) who revealed that, the principle behind the use of Lysolecithin which include improved fat digestion and absorption as well as enhanced nutrient utilization opens opportunities to replace expensive fat sources with more economical alternatives thereby reducing feed cost while maintaining optimal growth and productivity.

4.3 Effect of supplemental lysolecithin at different levels on apparent retention (% of intake) of nutrients by noiler birds

Nutrient retention of noiler birds fed varying dietary levels of supplemental Lysolecithin significantly impacted on dry matter DM and crude fiber CF digestibility coefficients. Birds fed diets containing supplemental Lysolecithin significantly retained more nutrients, which was also comparable to birds on the control diet. This observation can be attributed to the effect of supplemental Lysolecithin which might have improved the digestion, absorption and utilization of fats thereby enhancing the digestion of other nutrients (Jan, 2023). Results of this present study is in line with reports of Singh and Kim, (2021) who reported that fiber can act as an antinutrient, as it often encapsulates nutrients in cell walls of plant-based feed ingredients; negatively influencing viscosity of digesta and impact on mineral absorption. The relationship between the breaking down of fiber encapsulating soluble nutrients to enhance the utilization of other nutrients for an effective digestive process has been reported (Irekhore, et al., 2006). This suggest that, the effect of supplemental Lysolecithin on fat digestion probably influenced the digestibility of other nutrients such as DM and CF as seen in the result. Similarly, reports of (Jansen, 2015; Zhao and Kim, 2017) found that dietary lysolecithin linearly increased the digestibility of dry matter, crude protein, crude fiber, and crude fat and attributed the improved nitrogen retention to the emulsification characteristics of lysolecithin. In contrast to this present study, Zhang et al. (2011) did not observe any effect on the nutrient retention of birds fed lysolecithin and other fat sources.

4.4 Effect of Supplemental lysolecithin at Different Levels on the oxidative status of noiler chicks (Day 0-28)

Dietary supplementation with lysolecithin had significant effect ($p < 0.05$) on glutathione reductase (GR). Birds fed supplemental lysolecithin show positive response responsible for maintaining the key role in the cellular control of reactive oxygen species associated with oxidative stress (Min & Ahn, 2005). Oxidative stress is the presence of reactive species (RS) in excess amount compared to the anti-oxidant capacity of animal cells (Halliwell & Whiteman, 2004). Such reactions are triggered by a broad range of adulterants such as dirt, chemicals, micro-organisms, environmental and fungal toxins (Estévez, 2015). Result of this present study suggest test diets that are devoid of toxins that trigger oxidative stress; which has severe implications on poultry's health status and production efficiency by disturbing the chicken GIT which is a delicate organ responsible for proper nutrient absorption and digestion (Gonzalez-Rivas et al., 2020). Birds fed supplemental lysolecithin were also unaffected by oxidative stress indices as it was seen in the non-effect of dietary lysolecithin on the oxidative status parameters of superoxide dismutase (SOD), catalase (CAT), malondialdehyde (MDA), glutathione peroxidase (GPx) and glutathione (GSH). This indicates the protective role in combating oxidative stress, the enhanced free radical scavenging activities and decreased lipid peroxidation in noiler birds fed dietary lysolecithin (El -Gendi et al., 2023). Result of this present study suggests that the test diets were free of toxicants that hinder metabolic processes leading to increased lipid and protein oxidation that affects meat quality (Lan et al., 2005). In agreement with this present study Droval et al. (2012) found that increasing lipid and protein oxidation caused by oxidative stress affects the functionality and digestibility of proteins and oxidation of pigments such as heme that alter the meat color leading to the consumer rejection of the meat.

5. CONCLUSION

In conclusion, dietary lysolecithin supplementation produced positive effects on noiler bird's performance, apparent nutrient retention, antioxidant status and was cost effective. Lysolecithin could therefore be supplemented up to 100 g /100 kg in noiler chicks' diet for enhanced growth performance, nutrient digestibility and cost effectiveness without compromising antioxidant status of noiler birds.

ACKNOWLEDGEMENT

The author is grateful to Tertiary
Education Trust Fund (TETFund),
Nigeria for sponsoring this research
through project no TETF/DR&D/CE/UNI/NSUKKA/BR/2020/VOL.1, 24

REFERENCES

Abd El-Hack, M. E., El-Saadony, M. T., Salem, H. M., El-Tahan, A. M., Soliman, M. M., Youssef, G. B. A., Taha, A. E., Soliman, S. M., Ahmed, A. E., El-Kott, A. F., Al Syaad, K. M., & Swelum, A. A. (2022). Alternatives to antibiotics for organic poultry production: types, modes of action and impacts on bird's health and production. *Poultry science*, *101*(4), 101696. https://doi.org/10.1016/j.psj.2022.101696

Adesehinwa, A. O.K 2016. Energy and protein requirement of pigs and the utilization of fibrous feedstuff in Nigeria: African Journal of pig Farming Vol 4(6). Pp 001-009

Aebi, H.(1974). Catalase in vitro, Methods Enzymol, 105:121-126.

AOAC. (2006). Official methods of Analysis. 18th Edn., Association of Official Analytical Chemist (AOAC). Washington, DC., USA.

Banrie. (2013). Reducing Feed Costs by the Use of Phytogenics. Retrieved From https://www.thepoultrysite.com/articles/reducing-feed-costs-by-the-use-of-phytogenics

Deji-folutile, J. (2022). Important facts about Noiler Chicken. Retrieved From https://farmingadvicedigest.com/2022/02/12/important-facts-about-noiler-chicken/

Droval AA, Benassi VT, Rossa A, Prudencio SH, Paião FG, Shimokomaki M. Consumer attitudes and preferences regarding pale, soft, and exudative broiler breast meat. Journal of Applied Poultry Research. 2012.

Duncan, D.B. (1955). New Multiple Range Test Biometrics. 11:1-42

L-Gendi, G., Abdelmoez, W., Abou-Emera, O. and Eid, K., 2023. Dietary influence of de-oiled lecithin on broiler growth, Blood parameters, Antioxidant status, Thyroid hormones and immunoglobulins: An analysis across two distinct strains of broilers. Livestock Science, 277, 105356.

Estévez M. Oxidative damage to poultry: from farm to fork. Poultry Science. 2015; 94(6): 1368–1378

Ewubare, D. B & Ozar, V. (2018). Effect of Poultry Production on Agricultural Production in Nigeria. https://doi.org/10.20448/journal.502.2018.51.8.16

Gonzalez-Rivas PA, Chauhan SS, Ha M, Fegan N, Dunshea FR, Warner RD. Effects of heat stress on animal physiology, metabolism, and meat quality: A review. Meat Science. 2020; 162: 108025.

Halliwell B, Whiteman M. Measuring reactive species and oxidative damage in vivo and in cell culture: How should you do it and what do the results mean? In British Journal of Pharmacology. 2004.

Iji, P.A., Toghyani, M., Ahiwe, E.U. & Omede, A.A. (Eds.) (2017). Alternative sources of protein for poultry nutrition. Cambridge, United Kingdom: Burleigh Dodds Science Publishing Limited. https://doi.org/10.19103/as.2016.0011.13

Irekhore, O., Bamgdbose, A. M and Olubadewa, G. A 2006. Utilization of cassava peel meal as Energy source for growing pigs. Journal of Anim. Vet. Adv. 5(10):849-851Jan Dirk, 2023. The 3 benefits of lysolecithin in animal feed. OLUST, Nature for health News Blogs olusplus B. V Randweg 8 and 10 8061 RW Hasset The Netherlands.S

Jansen, M., 2015 Modes of action of lysophospholipids as feed additives on fat digestion in broilers.

Jensen, C.,Engberg, R., Jakobsen, K., Skibsted, L.H.and Bertelsen,G.(1997). Influence of the oxidative quality of dietary oil on broiler meat storage stability. Meat Sci., 47:211-222.

Jollow DJ, Mitchell JR, Zampaglione N and Gillete JR.(1974). Bromobenzene-induced liver necrosis, Protective role of glutathione and evidence for 3,4-bromobenzene oxide as the hepatotoxic metabolite. Pharmacol. 11, 151-169.

Kakkar, P., Das, B. and Viswanathan, P.N. (1984) A Modified Spectrophotometric Assay of Superoxide Dismutase. Indian Journal of Biochemistry and Biophysics, 21, 130-132.

Lan Y, Verstegen MWA, Tamminga S, Williams BA. The role of the commensal gut microbial community in broiler chickens. World's Poultry Science Journal. 2005.

Lowry, O. H., Rosebrough, N. J., Farr, A. L and Randall, R .J. (1951). Protein measurement with the Folin phenol reagent. J Biol Chem.,193(1):265-75

Metwally, A. E., Abdel-Wareth, A. A. A., Saleh, A. A. & Amer, S.A. (2020). Are the energy matrix values of the different feed additives in broiler chicken diets could be summed? BMC Vet Res. 16:391. doi: 10.1186/S12917-020-02600-3

Min B, Ahn DU. Mechanism of lipid peroxidation in meat and meat products - A review. Food Science and Biotechnology. 2005.

Singh and Kim 2021. Effect of Dietary fiber on nutrient utilization and health of poultry: A review of challenges and opportunities. Animals 2021 11(1).18 https://doi.org/10.3390/ani11010818

SPSS. (2007). Statistical Package for Social Sciences version 17.0. SPSS Inc. Chicago, U.S.A.

Tanimo, H.A.A., Oshibanjo, D.O., Adelowo, V.O., Akwashiki, M.A., Azi, I.W., James, O.C., Haruna, S. & Sunday, A.Y. (2020). Growth Performance, Carcass Characteristics and Heamatology Indices of Broiler Chicken Fed Graded Levels of Mango (Mangifera indica) Leaf Meal. Asian Journal of Research in Animal and Veterinary Sciences, 6(2), 20–27.

Worldometer. (2024). Nigeria Population. Retrieved from https://www.worldometers.info/world-population/nigeria-population/

Zhang, B., Haitao, L., Zhao, D., Guo, Y. and Barri, A., 2011. Effect of fat type and lysophosphatidylcholine addition to broiler diets on performance, apparent digestibility of fatty acids, and apparent metabolizable energy content. Animal Feed Science and Technology, 163, 177-184.

Zhang, Z., Zhang, S., Nie, K., Zheng, H., Luo, Z. and Kim, I.-H., 2022. Lysolecithin improves broiler growth performance through upregulating growth-related genes and nutrient transporter genes expression independent of experimental diet nutrition level. Animals, 12, 3365.

Zhao, P. & Kim, I. (2017) Effect of diets with different energy and lysophospholipids levels on performance, nutrient metabolism, and body composition in broilers. Poultry Science, 96, 1341-1347.