EFFECT OF *IN OVO* INJECTION OF LYSINE AND METHIONINE ON HATCHING TRAITS AND GROWTH PERFORMANCE OF GUINEA FOWL

***Idowu[2], O.P.A[1,2], Adeyeye, E. A.[3], Kareem[3], D.U.[3], Iyanda, A.I.[2], Amos, Rotimi, O.S.E.[2], A.T.[3], Sogunle, O.M.[2] and Idowu[3], O.M.O.[3]**

[1]Agricultural Media Resources and Extension Centre, Federal University of Agriculture, P.M.B 2240, Abeokuta, Ogun State, Nigeria
[2]Department of Animal Production and Health, Federal University of Agriculture, P.M.B 2240, Abeokuta, Ogun State, Nigeria
[3]Department of Animal Nutrition, Federal University of Agriculture, P.M.B 2240, Abeokuta, Ogun State, Nigeria
***Corresponding Author**: idowuopa@funaab.edu.ng, **Phone Number:** +2348029287503*

ABSTRACT
A study was aimed to examine the effect of in ovo injection of lysine and methionine on Guinea fowl hatching traits and growth performance. Fertile eggs (n=300) were sourced from a reputable breeder farm and fumigated, weighed, and incubated. Dead embryos were removed, and living embryos were redistributed into treatment groups of control, de-ionized water, lysine, methionine, and a combination of lysine and methionine. The injection was performed on the 25th day of embryonic development, and the eggs were returned to the incubator within 30 minutes. Keets were managed intensively and starter and grower diets were provided. The Lysine injection resulted in the highest hatchability (72.5%) while Control had the highest dead in shell and weak in shell (20, and 15%, respectively). Lysine + Methionine injection resulted in the highest final body weight (1077.5g), weight gain (898.75g), and the best feed conversion ratio (2.33 %). The Feed intake was lowest (2094.75g) for lysine + methionine. It was concluded that in ovo injection of 10 mg/0.5 ml, lysine positively impacted hatchability, and methionine, alone or with lysine, enhanced growth.
Keywords: ***de-ionized, guinea fowl, in-ovo, lysine, and methionine***

INTRODUCTION

The pressure on breeders to increase growth rate, feed efficiency, breast muscle size, and abdominal fatness (Petracci *et al*., 2013) has led to research on improving poultry meat production techniques and carcass compositions with additives. Ayorinde (2004) highlights the importance of Nigeria's indigenous guinea fowl, a gallinaceous bird of the *Numididae* family. The indigenous species contribute significantly to animal protein availability, ranking second to domestic fowl in number and supply. Guinea fowl production as a meat bird is profitable, offering opportunities for commercialization in various parts of the world, as noted by Ayorinde (2004). Among the challenges of guinea fowl production, despite its abundant population and numerous benefits is nutrition but Ferket (2006) suggested that chick growth can be increased with *in ovo* nutrition. *In ovo* nutrient feeding on days 16, 17, and 18 of incubation has been found to improve avian digestive tract development, digestion capacity, feed conversion ratio, skeletal muscle development, and breast meat yield, while reducing skeletal system disorders, diseases, and deaths (Foye *et al.,* 2006). Ohta *et al.* (1999) found that the amount of essential and non-essential amino acids in avian embryos is insufficient for protein synthesis, accretion, and muscle production. They suggested that exogenous amino acids, particularly lysine and methionine, should be applied to eggs *in ovo*. This study is therefore undertaken to obtain basic information on the effect of *in ovo* injection of lysine and methionine on hatching traits and growth performance of guinea fowl keets.

MATERIALS AND METHODS

The entire experiment was carried out at the Poultry unit of the Directorate of University Farms (DUFARMS), Federal University of Agriculture, Abeokuta, Ogun state, Nigeria.

Hatching of eggs

A total of three hundred hatchable eggs of Guinea fowl were sourced from a reputable breeder farm, in Kano state, and were fumigated, weighed, and set into the incubator. On the 21st day of incubation,

the eggs were checked for fertility by candling, and dead embryos were removed from the incubator. The eggs with living embryos were redistributed into the five treatment groups of control *in ovo-supplemented* groups (Table 1)

Table 1: Description of *the in ovo injection* treatment groups

Treatment	*in ovo*
Control (negative)	(un-injected eggs)
De-ionized water	(*in ovo* with 0.5 mL^{-1} Deionized water egg^{-1})
Lysine	(*in ovo* with 0.5 mL^{-1} Deionized water and 10mg lysine)
Methionine	(*in ovo* with 0.5mL^{-1} Deionized water and 10mg methionine)
Lysine + Methionine	(*in ovo* with 0.5mL^{-1} Deionized water and 10mg lysine and 0.5mL^{-1} Deionized water and 10mg methionine)

Procedure for *in ovo* injection of lysine, methionine, Lysine + Methionine

A total of 202 (67.33%) fertile eggs were with living embryos and were redistributed into the five treatment groups with 40 eggs for each treatment and left with an excess of 2 eggs (Table 1). On the 25th day of embryonic development, the 40 eggs were injected based on their treatment group with deionized water, Lysine, Methionine, and Lysine + Methionine using a 24-gauge hypodermic needle (Bhanja *et al.,* 2005). The surface of the broad end of the eggs was disinfected with 30% Ethanol to prevent contamination. After *In-ovo* injection, the points injected were sealed with wax, and the eggs were taken back into the incubator. The exercise was completed within 30 minutes of taking out eggs from the incubator.

Management of post-hatched keets

Post-hatch performance of keets was raised to evaluate the effect of *in ovo* injection of lysine and methionine on post-hatched keets (Table 2). Birds were weighed and distributed into their respective five treatments and replicated four times with an equal number of 5 keets per replicate.

Birds were managed intensively on a deep litter system; feeders and drinkers were uniform under standard management conditions. Standard starter (0-4 weeks) and grower (5- 12 weeks) basal diets were fed to the keets. Feed and drinking water were provided *ad libitum*. The experiment lasted for 84 days.

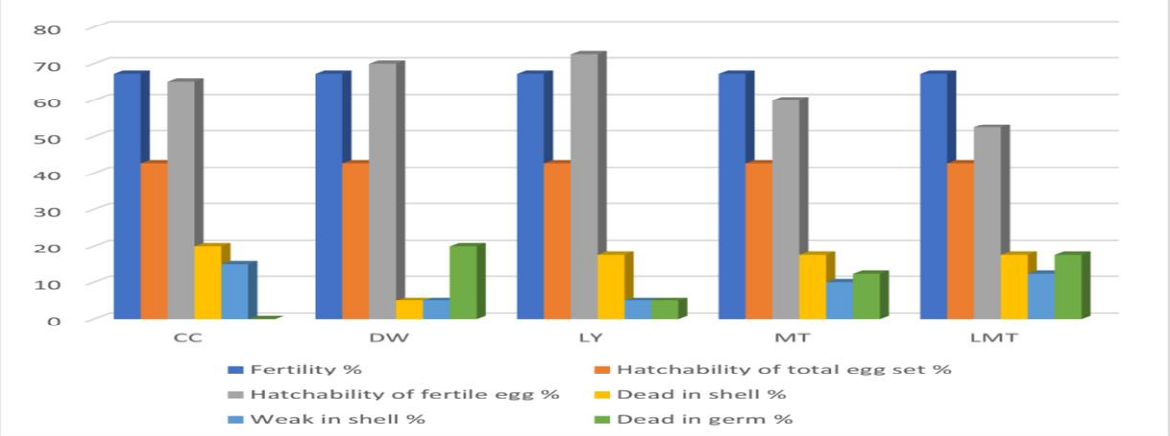
Statistical Analysis

The data collected from the experiment were subject to Analysis of Variance (ANOVA) using one way for a completely randomized design. Significantly ($P < 0.05$) differences among means were separated using Duncan's Multiple Range Test as contained in the Statistical Analyst System (SAS, 2012) package.

RESULTS AND DISCUSSION

The results of this study are presented in Figure 1 and Table 2. There were constant values in fertility percentage and hatchability of total egg set percentage across the treatment, which was done before

Figure 1: Effect of *in ovo* injection on hatchability of guinea fowl eggs



Where CC= Control; DW= Deionize water; LY= Lysine; MT= Methionine; LMT= Lysine + Methionine
the eggs were distributed to each treatment. The highest hatchability of fertile egg percent was recorded in eggs injected with lysine 72.5%, while the highest dead in shell (20%), and weak in shell (15%) was recorded for control compared to those on *in ovo* injection. Deionized water had the highest (20%) dead in germ values. The percentage of hatchability of fertile eggs was highest (72.5%) in the lysine-injected hatching eggs resulting from an increase in hatched keets (Figure 1). Lysine was also reported to increase hatchability without affecting relative chick weight (Coskun *et al*., 2018).

Table 2: Effect of *in ovo* injection of lysine and methionine on growth performance of Guinea fowl

PARAMETERS	CC	DW	LY	MT	LMT	SEM	P-value
Initial Body Wt (g)	166	172.75	176.25	173.25	178.75	2.79	0.7143
Final Body wt (g)	831^{c}	959.5^{b}	934.25^{b}	956.25^{b}	1077.5^{a}	18.55	<.0001
Weight gain (g)	665^{c}	786.75^{b}	758^{b}	783^{b}	898.75^{a}	17.99	<.0001
Feed Intake (g)	2322.25^{a}	2356.5^{a}	2317.25^{a}	2199.25^{b}	2094.75^{c}	23.29	<.0001
FCR (%)	3.49^{a}	2.99^{b}	3.05^{b}	2.81^{c}	2.33^{d}	0.08	<.0001
Mortality (%)	93.75	93.75	100.00	100.00	100.00	0.00	0.6900

$^{a, b, c}$ Means in the same row not sharing common superscript are significantly different ($p<0.05$)
Where CC= Control; DW= De-ionized water; LY= Lysine; MT= Methionine; LMT= Lysine + Methionine

The final body weight, weight gain, feed intake, and feed conversion ratio were all significantly ($p<0.05$) influenced (Table 2). The highest values were recorded for the final body weight, weight gain, and the feed conversion ratio of Guinea fowl from the combination of lysine + methionine injected eggs (1077.5g, 898.75g, 2.33%), respectively. This implies that the injection of lysine + methionine supported a better performance of guinea fowl keets. The result was in tandem with the reports of Bakyaraj *et al.* (2012) who reported a significant improvement in feed intake, average body weight gain, and feed conversion ratio of Guinea fowl in lysine + methionine injected eggs. Meanwhile, the lowest (2094.75g) value of feed intake was recorded for eggs injected with lysine + methionine, indicating the lower the feed intake the better the feed conversion ratio. Mukhtar *et al.* (2007) found that dietary increases of lysine + methionine had a significant effect on feed intake, body weight, and feed conversion. However, the combination of Lysine + Methionine injection resulted in the highest final body weight, weight gain, and the best feed conversion ratio. The best survivability was noted in guinea fowl keets from *in ovo* injection with the amino acids particularly guineas fowl subjected to *in ovo* injection of lysine, methionine, and a combination of lysine and methionine contrary to keets subjected to the control and deionized water.

CONCLUSION AND RECOMMENDATION

In conclusion, the findings of this study indicate that the dietary supplementation of the *in ovo* injection of 10 mg/0.5 mL of lysine has a positive impact on the hatchability of fertile eggs in guinea fowl. Furthermore, the *in ovo* injection of methionine, either administered alone or in combination with lysine, demonstrates an enhancement in performance. These results suggest that the *in ovo* injection of 10 mg/0.5 mL lysine can effectively improve the hatchability of guinea fowl. In contrast, the combined injection of lysine and methionine holds promise for enhancing the growth performance of guinea fowl. Therefore, it is recommended that practitioners consider incorporating these *in ovo* injection strategies to optimize both hatchability and growth performance in guinea fowl production.

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