
PERFORMANCE OF LAYING BIRDS FED DIETARY LEVEL OF MONOSODIUM GLUTAMATE

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ABSTRACT

The study was carried out at the poultry unit of the Teaching and Research Farm, The Federal University of Technology, Akure. A total of 144, 16 weeks old Isa Brown were purchased. They were fed commercial grower mash until they reached 20% laying performance (22 weeks of age) before they were subjected to the experimental diets for sixteen weeks. The pullets were weighed at the beginning of the study and randomly allotted to the experimental diets containing 0.00, 0.25, 0.50, 0.75, 1.00 and 1.25g/kg Monosodium Glutamate (MSG). Each treatment was replicated 4 times with 6 birds per replicate in a completely randomized design, data was analysed using SAS 2008. The birds were fed twice daily (morning and afternoon) and water was provided ad-libitum. The birds were housed in a three-tier cage system. Feed consumption and weight gain and live weight of birds at the last week of the experiment were recorded while feed conversion ratio (FCR) was calculated. Eggs were collected weekly and egg quality (egg weight, egg length, egg width, shell weight and shell thickness) were determined. The results showed that egg weight, egg length, egg width, shell weight and shell thickness were significantly influenced ($p < 0.05$) by the treatments. Also, feeding birds with 0.75% MSG improved hen day production and feed efficiency through least feed conversion ratio. Egg weight, egg length and egg width of eggs gotten from birds fed 0.25% MSG diet were better.

Keywords: Layers, Monosodium glutamate, Egg quality, Growth

INTRODUCTION

The impact of livestock production and affordable animal's source foods on food security is enormous. Food security is more than the consumption of sufficient calories; it is also the consumption of food of adequate quality (FAO, 2011). The low level of animal protein intake which falls below the standard recommendation by FAO justifies the need for more research on how to increase animal protein source and one of the ways to achieve this is by the use of feed additives. Therefore, any feed additive that will improve egg production of a good quality at lower cost of production to the farmer is of interest. One of the major poultry products is egg which is more affordable for the common person than other sources of animal protein (Aboki et al., 2013). The use of feed additives has been an important part of achieving this success. However, in poultry diets these additives are primarily included to improve the efficiency of bird's growth and/or laying capacity, prevent disease and improve feed utilization. Inclusion of feed additives at a safe rate which can bring about improvement in feed palatability and acceptability required performance will be greatly welcomed.

MATERIALS AND METHODS

This experiment was carried out at the Poultry unit of the Federal University of Technology, Akure, Ondo State. One hundred and forty-four (144) point of lay (POL) pullets (Isa brown) were randomly allotted to six dietary treatments that were replicated four times. The pullets were placed on a commercial grower mash until they have reached 20% laying performance before they were subjected to the experimental diets for a period of 16 weeks. MSG was included in the diet at 0.00mg, 0.25mg, 0.50mg, 0.75mg/kg, 1.0mg/kg and 1.25mg/kg as Treatments A, B, C, D, E and F respectively. Data on feed consumption and weight gain were recorded while feed conversion ratio (FCR) was estimated and live weight was recorded at the end of the experiment. Eggs were collected weekly per replicate and egg quality was determined in the laboratory. The eggs were weighed before being carefully broken, the contents removed and the shells air-dried for two days before taking the weight. Egg weight, yolk weight and shell weight were measured with sensitive scale calibrated in grammes. The

albumen weight was calculated by subtracting the sum of the weights of the shell and the yolk from the total egg weight. Shell thickness was measured with micrometer screw gauge. The mean of the measurements taken from these regions (broad, narrow and equatorial) were taken to ensure accuracy. Shell weights, Hen day production (HDP), Yolk index, Yolk weight, the width and the length of the eggs were also determined according to standard procedure.

Table 1: Composition of experimental diets

Ingredients	Quantity (%)
Maize	52
Soybean meal	22
Wheat Offal	13
Bone meal	4.0
Limestone	8.0
Lysine	0.25
Methionine	0.38
Common salt	0.30
Layers premix	0.25
Calculated Nutrients	
Metabolizable Energy (Kcal/Kg)	2687.28
Total	100.18
Crude protein (%)	16.74
Calcium (%)	3.80
Available phosphorus (%)	0.54
Methionine (%)	0.35
Lysine (%)	0.78
Crude fibre (%)	3.52

Statistical Analysis

Completely randomized design was used to allocate birds into the different treatments. Data collected was analysed using analysis of variance (ANOVA) and means separated using Duncan Multiple Range Test. The statistical package used was SAS 2008.

RESULTS AND DISCUSSION

The results of the performance characteristics of laying birds fed with monosodium glutamate are in Table 2. The study revealed that there was a significant ($p < 0.05$) differences in final weight, weight gained, Feed intake, HDP and FCR. Birds fed with 1.00mg Monosodium glutamate had the highest final weight, weight gain and FCR. There was significant increase in feed intake of chicks fed on diet with MSG and this could be attributed to the fact that MSG was palatable and accepted by the birds. Similar responses were reported by Tanaka *et al.* (1983) and Reddy *et al.* (1986). Feed conversion ratio was also significantly influenced by dietary MSG, birds fed on 0.75% MSG greatly utilize the feed efficiently and hence produced highest eggs. This finding is at variance with that obtained by Mohammed (1994).

Table 2: Performance characteristics of laying hens fed diets supplemented with monosodium glutamate (mg/kg).

Parameters	T A	T B (0.25%)	T C (0.50%)	T D (0.75%)	T E (1.0%)	T F (1.25%)	P-value
IW (g)	0.00	0.25	0.50	0.75	1.00	1.25	
FW (g)	1176.00 ± 31.11	1184.67 ± 24.92	1185.00 ± 6.93	1212.33 ± 4.42	1187.33 ± 15.10	1174.33 ± 3.94	0.7086
WG (g)	1681.00 ± 28.60 ^a	1639.33 ± 9.61 ^{ab}	1673.00 ± 9.99 ^c	1611.67 ± 9.93 ^{bc}	1685.00 ± 11.82 ^a	1569.00 ± 11.79 ^c	<.0001
FI (g)	505.00 ± 54.29 ^a	454.67 ± 23.63 ^{ab}	488.00 ± 13.77 ^a	399.33 ± 8.95 ^b	497.67 ± 18.10 ^a	394.67 ± 13.85 ^b	0.0106
Hdp (%)	107.00 ± 0.47 ^c	108.01 ± 1.50 ^c	108.48 ± 0.84 ^{bc}	111.15 ± 1.21 ^{ab}	111.73 ± 0.82 ^a	112.92 ± 1.14 ^a	0.0024
Fcr (%)	67.26 ± 2.27 ^b	72.47 ± 1.34 ^{ab}	71.88 ± 0.32 ^{ab}	76.60 ± 2.46 ^a	71.58 ± 4.60 ^{ab}	67.65 ± 0.69 ^b	0.0876
FCR	5.73 ± 0.20 ^{ab}	5.30 ± 0.16 ^{ab}	5.34 ± 0.05 ^{ab}	5.16 ± 0.11 ^b	5.73 ± 0.41 ^{ab}	5.92 ± 0.12 ^a	0.0880

*Initial weight *Final weight *Weight Gain *Feed Intake. *T-treatment

Shown in Table 3 is the external egg qualities of laying hens fed diets supplemented with monosodium glutamate. It was discovered that shell weight was significantly different across the

treatments and birds fed on TB (0.25% MSG) had a higher value than other treatment. This result agreed with the findings of Costa *et al.* (2004) who observed the effect of crude protein levels on shell weight, in which the eggs of semi-heavy laying hens fed diets containing 16% of crude protein presented the highest weight of the eggshell. Alewi *et al.* (2012) reported that egg shell thickness is an important bio-economic trait that layer chicken breeders incorporate in their breeding programmes to reduce egg shell breakages. The thickness of the eggshell is an important trait for hatchability. The variation observed in egg weight, length and width revealed that birds fed on diet supplemented with 0.75% monosodium glutamate recorded better egg weight, egg length and egg width. This implied that supplementation of 0.75% MSG improved the utilization of feed and therefore transformed into better egg quality and production. External egg qualities of laying hens fed diets supplemented with monosodium glutamate (mg/kg), thickness should be between 0.33 and 0.35 mm (Khan *et al.*, 2004). There were significant differences in shell thickness observed in this study but values recorded in this trial were slightly higher the values recommended by Khan *et al.* (2004).

Table 3: External egg qualities of laying hens fed diets supplemented with monosodium glutamate (mg/kg)

Parameters	TA (0.00%)	TB (0.25%)	TC (0.50%)	TD (0.75%)	TE (1.00%)	TF (1.25%)	P-value
EW	55.46±0.53 ^{ab}	55.90±0.38 ^a	54.32±0.41 ^{bc}	56.35±0.50 ^a	53.81±0.50 ^c	53.83±0.65 ^c	0.0002
EL	5.38±0.03 ^{ab}	5.42±0.03 ^a	5.32±0.02 ^{ab}	5.42±0.02 ^a	5.42±0.02 ^a	5.39±0.03 ^a	0.0107
EW	4.30±0.01 ^a	4.30±0.01 ^a	4.29±0.02 ^a	4.31±0.02 ^a	4.23±0.02 ^b	4.24±0.02 ^b	0.0006
SW	6.25±0.05 ^b	6.41±0.03 ^a	6.07±0.06 ^c	6.27±0.04 ^b	5.90±0.05 ^d	5.98±0.06 ^{cd}	<.0001
ST	0.42±0.00 ^a	0.41±0.00 ^{ab}	0.39±0.00 ^c	0.43±0.00 ^a	0.40±0.00 ^b	0.41±0.01 ^b	<.0001

*Egg weight *Egg length *Egg width *Shell weight *Shell thickness *T-Treatment

The internal egg qualities of laying hens fed diets supplemented with monosodium glutamate is as presented in Table 4. The study shows that Albumen has a major influence on overall interior egg quality. The albumen weight and height are important items in evaluating albumen quality and egg freshness. Significant differences observed indicated egg obtained from birds that fed treatment D (0.75% MSG) had better albumin weight to control and other treatments. Thinning of the albumen is a sign of quality loss. When an egg contains a large proportion of thick white are regarded as being of high quality. Albumen weight had been reported to be more closely associated with egg weight than yolk weight (Harms and Hussein, 1993). Supplementation of diet with 1.25% MSG greatly improved yolk length and yolk height, while yolk lengths are indicator to determine freshness and life span of eggs.

Table 4: Internal egg qualities of laying hens fed diets supplemented with monosodium glutamate (mg/kg)

Parameters	TA (0.00%)	TB (0.25%)	TC (0.50%)	TD (0.75%)	TE (1.00%)	TF (1.25%)	P-value
YL	4.20±0.02 ^a	4.19±0.02 ^a	4.17±0.02 ^{ab}	4.12±0.02 ^b	4.17±0.02 ^{ab}	4.12±0.03 ^b	0.0321
YW	3.85±0.03	3.83±0.02	3.84±0.02	3.83±0.02	3.84±0.02	3.83±0.02	0.9776
YH	1.77±0.02 ^a	1.70±0.02 ^b	1.67±0.02 ^{bc}	1.67±0.01 ^{bc}	1.65±0.02 ^c	1.67±0.02 ^{bc}	<.0001
YW	13.63±0.15	13.56±0.11	13.53±0.12	13.47±0.10	13.56±0.13	13.34±0.11	0.6600
AL	7.33±0.06 ^c	7.51±0.05 ^b	7.48±0.06 ^{bc}	7.58±0.05 ^{ab}	7.59±0.05 ^{ab}	7.69±0.07 ^a	0.0004
AW	5.88±0.06 ^b	5.93±0.04 ^{ab}	5.93±0.04 ^{ab}	6.00±0.04 ^{ab}	5.98±0.05 ^{ab}	6.05±0.05 ^a	0.1891
AH	1.28±0.02	1.26±0.01	1.23±0.01	1.24±0.01	1.22±0.01	1.35±0.13	0.5867
AW	33.70±0.36 ^{ab}	34.06±0.28 ^{ab}	33.25±0.30 ^{bc}	34.55±0.37 ^a	32.64±0.36 ^c	32.64±0.45 ^c	0.0003

*Yolk length-YL *Yolk width-YW *Yolk height-YH *Yolk weight-YW *Albumen length-AL *Albumen width-AW
*Albumen height-AH *Albumen weight-AW

CONCLUSION

Feeding birds with 0.75% MSG improved hen day production and feed efficiency through least feed conversion ratio. Egg weight, egg length and egg width of eggs gotten from birds fed 0.25% MSG diet were better. Monosodium Glutamate at 0.25% can be recommended for farmers to be added to layers diet to improved egg properties. Further studies should be carried out using diverse ratio to determine structural integrity of visceral organs.

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