REPRODUCTIVE MORPHOMETRY CHARACTERISTICS OF LAYING BIRDS FED DIETARY LEVEL OF MONOSODIUM GLUTAMATE

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ABSTRACT
The Federal University of Technology, Akure's teaching and Research Farm's poultry section served as the study's location. A total of 144 Isa Browns, aged 16 weeks, were acquired from Amo hatchery. After being fed commercial grower mash until they were 22 weeks old, or 20% of laying performance, they were given the experimental diets for sixteen weeks. At the start of the study, the pullets were weighed and then randomly assigned to one of the experimental diets that included 0.00, 0.25, 0.50, 0.75, 1.00, or 1.25g/kg of Monosodium Glutamate (MSG). With six birds per replication, each treatment was duplicated four times in a totally randomized design. The birds were managed under the standard procedures. 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. Data collected were analyzed using Statistical Analysis System (SAS). The entire reproductive tracts of the slaughtered and eviscerated birds were removed and examined. There was no significant (p>0.05) difference in weight of entire reproductive tract (ERT), weight of ovary, infundibulum length, isthmus length and vagina length. Numerically, treatment C had heaviest ERT (132.83± 4.14g) and ovary (34.73± 3.10g) while lightest ERT (115.97±17.59g) and ovary (26.87± 6.03g) were observed in treatment A and B respectively. Significant (P<0.05) differences were observed in magnum and uterus length. The longest (16.10±2.59cm) and shortest (9.43±0.44cm) magnum length were observed in treatment D and A respectively. It was observed that as the level of monosodium glutamate in the diet increased, uterus length decreased.
Keywords: Layers, Monosodium glutamate, Growth, Reproductive and Morphometry

INTRODUCTION

Monosodium glutamate (MSG) is a worldwide flavour enhancer. It gives a taste described in Japanese as umami. The flavor sensation of MSG is described as "meaty" unlike that of salt (sodium chloride), sweet (sucrose), pungent (chili peppers), bitter (quinine) or sour (lemon juice) basic flavor sensations (Keast and Brestlin, 2003). In addition, MSG enhances natural taste in vegetables, meat, mushrooms and fish (Singh, 2005). Despite controversy surrounding the safety of MSG, it is still consumed in large amounts globally, increasing the use of prepackaged food and Chinese food containing MSG triggered a new interest in academic community in MSG safety. Because excess of anything is bad, utilization of MSG up to certain level does not have any adverse effects since glutamate is a nutritionally indispensable amino acid (Kazmi *et al*; 2017). Food security, which is defined as consuming food of appropriate quality in addition to having an adequate supply of calories, is significantly affected by the production of livestock and the availability of cheap nourishment derived from animals (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. Monosodium Glutamate is a feed additive that will improve egg production of a good quality at lower cost of production to the farmer, reduce the risk of disease, and enhance feed utilization. Inclusion, MSG at a safe rate brings about improvement in feed palatability and acceptability which enhances great performance of the birds.

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 assigned at random to one of six dietary treatments, each of which was repeated four times. The pullets were fed the experimental diets for 16 weeks after being put on a commercial grower's mash until they reached a 20% laying performance. 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. Reproductive morphometric parameters were recorded for each organ (ovary, infundibulum, magnum, isthmus, shell gland and vagina) separately with the help of Vernier Caliper and scale. Completely Randomized Design was used to allocate birds into the different treatments. Data collected was analysed using analysis of variance (ANOVA) and means compared using Duncan Multiple Range Test. The statistical package used was SAS, 2008.

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

%: Percent

RESULTS AND DISCUSSION

The results of the performance characteristics of laying birds fed with monosodium glutamate are in shown in Table 2. There was no significant ($p>0.05$) difference observed in initial weight. but numerically, treatment D recorded highest (1212.33±4.42g) initial weight while least initial weight (1174.33± 3.94g) was recorded for treatment F. Significant ($p<0.05$) differences were observed in final weight in which treatment E had heaviest (1685.00± 11.82g) followed by treatment A (1681.00 ±28.60g) while treatment F had lightest weight (1569.00 ± 11.79g). It could be observed that inclusion of monosodium glutamate (MSG) significantly ($p<0.05$) reduced weight gain when compared with treatment A (0% MSG). Treatment C and E had similar value with treatment A. Therefore, treatment A recorded the highest (505.00 ± 54.29g) and treatment F recorded the least (394.67± 13.85g). The significant ($p<0.05$) differences observed in feed consumed revealed that as the inclusion level of MSG increased, feed consumption also increased. Hen day production (HDP) and feed conversion ratio ((FCR) were differed significantly ($p<0.05$) among the treatments. Treatment D recorded highest HDP (76.60±2.46%) and least FCR (5.16± 0.11)**.** Comparison of the weight change, final body weight with the initial body weight in each group revealed a significant difference and hence, final weight of those fed on treatment E (1.00%) was increased compared to other group. MSG intake could induce an increase in energy intake (Bergin *et al*., 1988) which could lead to obesity (Moses *et al,;* 2004) or alter the levels of carbohydrates, lipids and proteins in rats (Diniz *et al*, 2004). 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 (Tanak *et al,;* 1983) and (Reddy et al,; 1986). Addition of dietary MSG resulted in decreased body weight gain but treatment C and E similar to the control group. However, body weight gain decreased significantly in chicks fed 1.25% MSG compared to control. Feed conversion ratio was also influenced by dietary MSG, birds fed on 0.75% MSG were greatly utilize the feed efficiently and hence produced highest eggs. These findings disagreed to those 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
	0.00	0.25	0.50	0.75	1.00	1.25	
IW (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
FW (g)	1681.00 ±28.60^{a}	1639.33 ± 9.61^{ab}	1673.00±9.99^{c}	1611.67± 9.93^{bc}	1685.00± 11.82a	1569.00 ± 11.79^{c}	<.0001
WG (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
FI (g)	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
Hdp (%)	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

IW: Initial weight, FW: Final weight, WG: Weight Gain, FI: Feed Intake, T: treatment, Hdn: Hen day percentage, FCR; feed conversion ratios

The morphometry characteristics of laying hens fed diets supplemented with monosodium glutamate are shown in Table 3. Significant ($P<0.05$) differences were observed in magnum and uterus length. Longest (16.10±2.59cm) and shortest (9.43±0.44cm) magnum length were observed in treatment D and A respectively. It was observed that as the level of monosodium glutamate in the diet increased, uterus length decreased. There was no significant

(p>0.05) difference in weight of entire reproductive tract (ERT), weight of ovary, infundibulum length, isthmus length and vagina length. Numerically, treatment C had heaviest ERT (132.83± 4.14g) and ovary (34.73± 3.10g) while lightest ERT (115.97±17.59g) and ovary (26.87± 6.03g) were observed in treatment A and B respectively. Also, longest infundibulum (2.45±0.58cm) and isthmus (8.13±1.51cm) were recorded for treatment F and A respectively while, shortest infundibulum (1.48± 0.20cm) and isthmus (4.16±1.27cm) were recorded for treatment C and F respectively. There was no significant (p>0.05) differences observed in the lengths of vagina, longest (4.97±0.03cm) and shortest (3.53± 0.29cm) vagina were recorded for treatment F and C respectively. Significant difference observed in uterus length revealed that supplementation of MSG greatly reduced uterus length and this report similar to the findings of (Abelfattah *et al* 2016) who reported that uterus of rat fed with monosodium glutamate exhibited a comparative reduction in the endometrial glands associated with cellular hyperplasia and reduced vacuolated cells. This implied that supplementation of MSG would have adverse effect implantation. Supplementation of MSG in the diet generally improved the magnum length. This indicated that structural integrity of magnum has not been alter by monosodium glutamate supplementation and the level is not save for the bird

Table 3. Morphometry characteristics of laying hens fed diets supplemented with monosodium glutamate (g/kg).

Parameters	A (0.00)	B (0.25)	C (0.50)	D (0.75)	E (1.00)	F (1.25)	P-value
Wt of ERT	115.97±17.59	130.83± 13.47	132.83± 4.14	131.37± 16.69	125.77±21.39	128.27± 15.42	0.9745
Wt of ovary	30.73± 3.78	26.87± 6.03	34.73± 3.10	33.87± 2.76	29.87± 3.35	28.93± 4.44	0.7412
Infundibulum	1.64±0.33	1.66±0.19	1.48±0.20	1.93±0.14	2.35±0.08	2.45±0.58	0.1934
Magnum	9.43±0.44^{b}	9.65±1.05^{b}	10.40±0.66^{b}	16.10±2.59^{a}	12.50±0.40^{ab}	11.30±0.71^{ab}	0.0035
Isthmus	8.13±1.51	7.77±0.23	6.60±0.46	5.10±0.76	4.50±0.36	4.16±1.27	0.1402
Uterus	9.75±2.13^{a}	9.53±1.96^{a}	7.88±0.60^{ab}	7.08±0.49^{ab}	6.02±0.37^{b}	5.77±1.03^{b}	0.0329
Vagina	4.17±0.88	3.57±0.13	3.53±0.29	4.07±0.72	4.73±0.52	4.97±0.03	0.3481

CONCLUSION

Due to its increasing tendency to use MSG as a food additive, it is expected to increase food palatability by reducing satiety. Based on the results obtained it could be recommended that feeding birds with 0.75% MSG improved hen day production and feed efficiency through least feed conversion ratio. Another observation of interest was the increase in length of uterus (right horn, left horn and total uterine horn) in birds fed on 0.25% MSG diet of 0.25% MSG. Therefore, this level should be recommended for farmers to enable them to save cost which in turn means more profit. However, feeding monosodium glutamate to birds should not be totally condemned but further studies should be carried out using diverse ratio to determine the effects on morphometric properties.

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