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EGG QUALITY OF TANUVAS NAMAKKAL GOLD JAPANESE QUAIL (*Coturnix coturnix japonica*) FED DIET WITH DIFFERENT LEVELS OF ENERGY AND LYSINE

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Abstract: The response of laying Japanese quails (TANUVAS *Namakkal gold Japanese quail*, n = 360, divided into 36 subgroups) to three dietary levels of metabolizable energy (ME) and three different levels of lysine (3×3 factorial design) on growth performance was investigated in cage housing system. Nine diets including three levels of ME (2700, 2800 and 2900 Kcal/kg) each at three levels of lysine (0.8, 0.9 and 1.0 per cent) were formulated. Each diet was offered to 4 replicated groups of 10 Japanese quail layers from 10 to 29 weeks of age. The laying phase of twenty weeks was divided into five periods with 28 days duration. During the last three days of every 28 days period egg quality traits like egg weight, shape index, albumen index, yolk index and shell thickness were evaluated. Egg weight was significantly ($P<0.01$) better in low and medium energy and medium and high lysine. Significantly ($P<0.01$) higher shape index in low lysine, higher albumen index in low energy and lysine levels and higher yolk index in low and high lysine, with no significance in egg shell thickness.

Keywords: Energy, lysine, egg weight and egg quality.

Introduction

Genetic selection for higher body weight and egg production in Japanese quail is practiced during the last few decades leading to the evolution of new genetic line of quail (Hussain *et al.*, 2013). One such evolution is the new egg type Japanese quail strain "TANUVAS Namakkal gold Japanese quail" developed by the Department of Poultry Science, Veterinary College and Research Institute, Namakkal under Tamil Nadu Veterinary and Animal Sciences University. Since these quail has better growth rate, high production performance in terms of egg number and egg weight, it requires different nutrient levels than the conventional Japanese quail. Precise nutrient supply reduces feed cost, wastage of nutrients, environmental pollution, and bad aroma in poultry house, and thus improves bird welfare.

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Energy and protein are the main nutrients considered in feed formulation. Energy regulates feed intake, (Silva and Costa, 2009). Protein provides the amino acids for tissue growth and egg production. Amino acids are considered as the building blocks of proteins (Babangida and Ubosi, 2006). The ideal protein concept implies feeding the best ratios between lysine and other amino acids, thus reducing the crude protein content of the diet. Lysine in lower or excess levels, may bring metabolic damages, which affects the bird's performance (Kidd and Kerr, 1998). Hence this experiment has been formulated to study the effect of feeding different levels of energy and lysine on the external and internal quality characterisitcs of eggs like egg weight, shape index, albumen index, yolk index and shell thickness.

Materials and Methods

The experiment was conducted in "TANUVAS Namakkal gold Japanese quail" from day old to twenty nine weeks of age. The whole experimental period was divided into three phases *viz.* chick (0-2 weeks), grower (3-5 weeks) and layer (10-29 weeks)**.** Seven hundred and twenty day old quail chicks were divided into nine treatments with four replicates of 20 chicks each. Nine experimental diets were formulated in 3x3 factorial arrangements with three levels of dietary energy (2800, 2900 and 3000 Kcal/kg) and three levels of lysine (1.2, 1.3 and 1.4 per cent) during chick (0-2 weeks) and grower (3-5 weeks). After five weeks, only 10 females were retained in each replicate so a total of 360 birds were maintained during the laying phase. Nine experimental diets were formulated in 3x3 factorial arrangements with three levels of dietary energy (2700, 2800 and 2900 Kcal/kg) and three levels of lysine (0.8, 0.9, and 1.0 per cent) from 10-29 weeks during layer phase.

The quail chicks used for the experiment were housed in cage system and maintained under standard managemental conditions. The laying phase was divided into five periods with 28 days duration. Twenty four eggs per treatment were randomly collected during the last three days of every 28 days period and were used to measure the egg quality parameters such as egg weight, shape index, albumen index, yolk index and shell thickness. The data were analysed statistically as per the methods described by Snedecor and Cochran (1994).

Results and Discussion

Egg weight

Low (11.81g) and medium (11.74g) energy levels recorded significantly ($P<0.01$) higher egg weight when compared to high energy (11.41g) level. The medium (11.80g) and high (11.94g) lysine groups recorded significantly ($P<0.01$) higher egg weight when compared to low lysine group (11.22g). This was in accordance with the findings of Yusuf *et al.* (2016)

who recorded significantly (P<0.05) higher egg weight in low energy. On the contrary Abdel-Azeem (2011) recorded high egg weight in high energy group. Tarasewicz *et al.* (2006) reported significantly higher (P<0.05) egg weight in high and medium protein and lysine which is accordance with this study while Yusuf *et al.* (2016) reported significantly (P<0.05) high egg weight low protein group. Brand *et al.* (2003) explains that if energy or protein is limiting, birds can compensate by reducing egg size or the number of eggs laid or by increasing the laying interval and spreading the loss of egg formation over a longer period. Agboola *et al.* (2016) in his study showed that egg size and weight depend greatly on daily crude protein intake augmented by adequate dietary energy since layers do not store a large amount of protein. This study shows that low and medium energy levels of 2700 and 2800 is sufficient for egg weight whereas medium and high lysine levels of 0.9, 1.0% is needed to maintain the egg weight. While, Sethi *et al.* (2012) and Sung-Taek *et al.* (2012) reported no significant difference in energy and lysine levels in egg weight.

Shape index

Different energy level groups showed no significant difference for shape index while there was a significant difference in shape index in different levels of lysine supplemented groups. Low lysine group (78.78) had significantly higher shape index (P<0.01) when compared to medium (78.10) and high (77.75) lysine groups. This is in partial agreement with the findings of Abdel-Azeem (2011), Agboola *et al.* (2016) and Yusuf *et al.* (2016) who reported no significant difference in shape index due to feeding of different levels of energy and lysine in Japanese quails. Tarasewicz *et al.* (2006) reported significantly higher (P<0.05) shape index in low lysine which was in accordance with this study. On the contrary, Sethi *et al.* (2012) reported significantly (P<0.05) higher shape index in low energy.

Albumen index

Low energy group recorded significantly (P<0.01) higher albumen index (0.098) when compared to medium and low energy groups (0.092 and 0.094). Similarly low lysine group recorded significantly (P<0.01) higher albumen index (0.098) when compared to medium and low energy groups (0.094 and 0.092). Contrary to the above findings, Tarasewicz *et al.* (2006), Abdel-Azeem (2011) and Bulbul *et al.* (2015) reported no significant effect in albumen index with effect of feeding different levels of energy, lysine and protein.

Yolk index

No significant difference in yolk index was observed due to feeding of different levels of energy whereas low lysine group and high lysine group had significantly (P<0.01) higher yolk index (0.416 and 0.410) when compared to medium (0.407). Bulbul *et al.* (2015) reported no significant effect in yolk index with effect of feeding different levels of energy, lysine and protein whereas Tarasewicz *et al.* (2006) reported significantly higher (P<0.05) yolk index in high energy, protein and lysine.

Shell thickness

No significant difference in shell thickness was observed due to feeding of different levels of energy and lysine during the laying phase. This was in agreement with Sung-Taek *et al.* (2012), Abdel-Azeem (2011) and Bulbul *et al.* (2015).

Conclusion

Egg weight was significantly (P<0.01) higher in low and medium energy and albumen index was significantly (P<0.01) higher in low energy. Egg weight was significantly (P<0.01) higher in medium and high lysine. Shape index, albumen index and yolk index was significantly (P<0.01) higher in low lysine, with no significance in egg shell thickness. Based on these studies low energy and low lysine has performed well in all egg quality parameters while high lysine has performed well with regard to egg weight.

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Mean (±S.E.) of external and internal egg quality traits of "*TANUVAS Namakkal gold quail*" from 10 to 29 weeks of age as influenced by different levels of energy and lysine

Treatment groups	Egg weight	Shape index	Albumen index	Yolk index	Shell thickness
General Linear Model (GLM) analysis of Energy X Lysine level interaction					
T_1	11.24±0.13	79.24±0.22	0.106±0.002	0.424±0.003	0.202±0.001
T_2	11.32±0.21	79.09±0.42	0.093±0.002	0.412±0.004	0.203±0.001
T_3	11.10±0.20	78.01±0.42	0.095±0.001	0.413±0.004	0.203±0.001
T_4	11.84±0.20	78.25±0.32	0.096±0.002	0.405±0.003	0.203±0.001
T_5	11.86±0.13	77.70±0.29	0.091±0.003	0.407±0.003	0.201±0.001
T_6	11.69±0.09	78.35±0.49	0.096±0.002	0.408±0.003	0.202±0.001
T_7	12.34±0.10	77.84±0.30	0.091±0.002	0.411±0.004	0.204±0.001
T_8	12.03±0.08	77.61±0.28	0.092±0.001	0.415±0.003	0.202±0.001

T_9	11.43±0.20	77.80±0.43	0.093±0.002	0.404±0.003	0.203±0.001
P value	0.128	0.133	0.091	0.060	0.576
General Linear Model (GLM) analysis of Energy levels					
2700	$11.81^{A}\pm0.16$	78.44±0.18	$0.098^{A}\pm0.001$	0.413±0.004	0.203±0.001
2800	$11.74^{A}\pm0.12$	78.13±0.21	$0.092^{B}\pm0.002$	0.411±0.004	0.202±0.001
2900	$11.41^{B}\pm0.11$	78.06±0.25	$0.094^{B}\pm0.001$	0.409±0.005	0.203±0.001
P value	0.009	0.380	0.001	0.329	0.866
General Linear Model (GLM) analysis of Lysine levels					
0.8	$11.22^{B}\pm0.10$	$78.78^{A}\pm0.22$	$0.098^{A}\pm0.002$	$0.416^{A}\pm0.002$	0.203±0.001
0.9	$11.80^{A}\pm0.08$	$78.10^{B}\pm0.21$	$0.094^{B}\pm0.002$	$0.407^{B}\pm0.002$	0.202±0.001
1.0	$11.94^{A}\pm0.13$	$77.75^{B}\pm0.20$	$0.092^{B}\pm0.001$	$0.410^{A}\pm0.003$	0.203±0.001
P value	0.000	0.002	0.000	0.002	0.460

n=24

$^{A\ and\ B}$ Means within a column with different superscript differ significantly ($P < 0.01$)

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