EFFECTS OF VARYING DIETARY ENERGY AND PROTEIN ON EGG QUALITY PARAMETERS OF QUAILS

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ABSTRACT

The aim of this study is to seek the effect of dietary energy and protein on the egg qualities. A total of four hundred and eighty day old un-sexed Japanese quails of about the same weight (26.56±0.02) were studied over a period of 12 weeks. After hatching, chicks were raised together during one week and fed with starting diet then divided into four dietary treatments (T1, T2, T3 and T4) with 30 quails in each replicate. Each treatment was replicated four times. T1: Control (Standard diet)SD; T2: High Energy Low Protein diet (HELP) ; T3 : High Energy High Protein diet (HEHP) andT4 : Low Energy High Protein diet (LEHP) in a completely randomized design. After 12 weeks of laying, eggs were collected from each treatment for both the external and internal egg characteristics. Data obtained were analyzed using ANOVA at $\alpha_{0.05.}$

Egg weight was higher (P<0.001) in the HEHP diet, egg height was also higher (P<0.05) in HEHP diet as well. Internal egg qualities, albumin height and albumen length had a significant influence (P< 0.05) in the HEHP diet.The albumen volume and the Yolk weight had the highest level of significance (P<0.001) in the HEHP diet. The shell weight was significant (P<0.001) with the HEHP diet having the highest values. There was also significance (P< 0.001) in the shell membrane and shell percent (P< 0.01) in the LEHP diet. The haugh unit are not significant in all the diets (P>0.05) but HEHP had the highest % of haugh unit.The results indicate that high energy and high protein (HEHP) diets is suitable for optimum performance of Japanese quail in terms of weight gain and egg quality.

INTRODUCTION

Increased poultry production has been advocated as one of the fastest means of providing quality animal protein at minimum cost (Nwachuckwu, 2015). The quail production story is more recent and also has the same characteristics that occurred in the broiler and laying hen production.

The establishment of quail production assumed importance worldwide in the last decade, not only for being a laboratory animal for poultry and biomedical research, but also because it is commercially exploited for production of meat and eggs.

Japanese quails mature in about 6 weeks and are usually in full egg production by 50 days of age. With proper care, hens should lay 200 eggs in their first year of lay. Life expectancy is only 2 to 2½ years (Randall, 2008).Quails produce up to five generations per annum (Saidu, 2014).

The optimum performance of livestock depends largely on the quality and quantity of their dietary nutrients (El-katcha, 2014). Precise nutrient supply reduces feed cost, wastage of nutrients, environmental pollution, and bad aroma in poultry house, and thus improves animal welfare (Kaur, 2015). Nutrition is by far the most important single factor under the environment in which poultry birds are reared, since it accounts for 60-75% of the inputs in poultry industry.

The aim of this study is to seek the effect of dietary energy and protein on the egg qualities.

MATERIALS AND METHODS

Location:

The experiment was carried out in the Poultry Division of the National Veterinary Research Institute Vom which is located in Plateau state ,central Nigeria in Jos South Local Government .Its geographical coordinates are on Latitude 09^0 44' 0'' North ,08^0 4' East .The trial was carried out from September to November 2018 (Maplandia.com).

Animals and management:

A total of four hundred and eighty day old un-sexed Japanese quails of about the same weight (26.56±0.02) were studied over a period of 12 weeks . The birds were sourced and raised in the Poultry Division of the National Veterinary Research Institute Vom in Plateau state. After hatching, chicks were raised together during one week and fed with starting diet then divided into four groups of 30 chicks each.

Experimental diets:

Diets were composed with local available feedstuff such as corn, soya bean cake and offered as mash (Table 1) and were randomly assigned to each treatment. The experiment included 4 dietary treatments (T1 , T2 ,T3 ,and T4) with 30 quails in each replicate. Each treatment was replicated four times.

The experiment consisted of 4 treatments designated as:

T1 : Control (Standard diet)(SD)

T2 : High Energy Low Protein diet (HELP)

T3 : High Energy High Protein diet (HEHP) and

T4 : Low Energy High Protein diet (LEHP)

Egg collections

After 12 weeks of laying ,eggs were collected from each treatment for both the external and internal egg characteristics.

Data collected

External characteristics

Internal characteristics

Statistical analysis

Data collected were analyzed using General linear model of SAS (SAS 2010). Statistical variations were observed and means were separated using Duncan's multiple range test.

RESULTS

The effect of the diets on egg quality is presented on Table 1. The Egg width and Egg shape index were similar for all the groups (P>0.05). Egg weight was higher (P<0.001) in the HEHP diet, Egg height was also higher (P<0.05) in HEHP diet as well. For the internal egg qualities, the Albumin height and the Albumen length had a significant influence (P< 0.05) in the HEHP diet .The Albumen weight was significant (P<0.01) in the LEHP diet .The Albumen volume and the Yolk weight had the highest level of significance (P<0.001) in the HEHP diet. The yolk volume was significant (P<0.01) with the HELP diet having the highest value.

The shell quality showed no significant difference (P>0.05) in the shell thickness, values in all the diets ranged between 0.10mm to 0.15mm. However, the shell weight had values ranging from 1.38g to 1.74g ,and it was significant (P<0.001) with the HEHP diet having the highest values. There was also significance (P< 0.001) in the shell membrane and shell percent (P< 0.01) in the LEHP diet.The Albumen width ,Haugh unit ,Albumen index ,Yolk percent ,Yolk height ,Yolk width ,Yolk length , Yolk colour ,Yolk index ,Yolk /Albumen ratio , were all not significant in all the diets (P>0.05).

Table 1: Effect of dietary energy and protein on egg quality parameters of japanese quails

Parameter	SD	HELP	HEHP	LEHP	±SEM
Egg weight(g)	10.60^{b}	10.42^{b}	11.73^{a}	10.07^{b}	0.12***
Egg Height(mm)	29.12^{ab}	28.43^{ab}	29.92^{a}	26.64^{b}	0.54*
Egg width(mm)	22.61	22.5	23.3	21.35	0.43^{NS}
Egg Shape Index(%)	77.76	78.98	77.7	79.68	0.34^{NS}
INTERNAL QUALITY					
Albumen Height(mm)	3.97^{ab}	3.86^{ab}	4.46^{a}	3.73^{b}	0.12*
Albumen width(mm)	34.59	32.88	34.41	33.63	0.76^{NS}
Albumin Length(mm)	39.80^{a}	37.54^{ab}	39.84^{a}	33.80^{b}	0.79*
Albumin weight(g)	4.08^{b}	4.18^{b}	5.11^{ab}	5.95^{a}	0.24**
Albumin volume(ml)	4.81^{b}	4.66^{ab}	5.61^{a}	4.23^{c}	0.09***

Albumin percent(%)	38.47^{b}	39.52^{b}	43.70^{b}	62.17^{a}	2.90*
Haugh Unit	86.86	86.64	88.74	85.44	0.67^{NS}
Albumin index(%)	9.98	10.09	11.09	9.71	0.33^{NS}
Yolk weight(g)	3.29^{b}	3.49^{ab}	3.94^{a}	3.22^{b}	0.07***
Yolk percent(%)	31.63	34.01	33.41	33.03	0.56^{NS}
Yolk height(mm)	9.81	9.36	9.93	8.86	0.19^{NS}
Yolk width(mm)	21.76	21.37	22.04	20.12	0.43^{NS}
Yolk length(mm)	22.3	21.81	23.1	20.56	0.47^{NS}
Yolk volume(ml)	3.64^{b}	3.80^{ab}	4.08^{a}	3.50^{b}	0.06**
Yolk colour	2.07	1.81	2.04	1.94	0.08^{NS}
Yolk Index(%)	56.7	44.56	45.26	43.39	4.35^{NS}
Yolk/Albumin Ratio	0.95	0.99	0.91	0.98	0.02^{NS}
SHELL QUALITY					
Shell weight(g)	1.40^{b}	1.38^{b}	1.74^{a}	1.57^{ab}	0.04***
Shell Membrane(mm)	0.03^{b}	0.04^{b}	0.02^{b}	0.12^{a}	0.01***
Shell percent(%)	13.51^{b}	14.18^{b}	14.49^{ab}	15.47^{a}	0.19**
Shell Thickness(mm)	0.12	0.15	0.1	0.13	0.01^{NS}

[a, b] means with different superscripts within the same row differ significantly ($p<0.05$)., SEM means standard error of mean

SD= Control (Standard diet); HELP= High Energy Low Protein diet; HEHP= High Energy High Protein diet

LEHP= Low Energy High Protein diet

This present result was in line with Muhammad (2016), who indicated that the protein levels had no significant effect on albumin weight, yolk height, yolk width, yolk weight, yolk index, yolk colour and Haugh unit ($P>0.05$). In this study all that were indicated were not significant except Albumin weight which was significant ($P<0.01$). It was concluded in his study that increasing dietary protein level of 25% will increase the egg production performance of Japanese quails. Similar results was obtained with the report of Lotfi (2018) who reported that the groups of quails that were fed more energetic feeds, significantly higher egg weights were achieved. Gunawardana (2008) reported that dietary energy had no influence on egg weight. Wu *et al.* (2005), and Sohail (2003), who reported that egg weights of hens with high protein diets were greater than of those hens with low protein diets, which is a consequence of the increase in albumen and yolk weights was in line with the results obtained in this study. This study is also in agreement with Lotfi (2018) who reported that the increase of albumen weight might be partially attributed to the improved nutrient (protein, total sulfur amino acids, or lysine) utilization with increased dietary energy. On the other hand, Novak *et al.* (2006) reported that shell quality was affected by protein and its ratio in diet, which could potentially have serious consequences for commercial egg-laying operations which is in line with this study. The work of Lotfi (2018) which stated that the shell protein matrix is comprised of 70% protein ,and also, increasing the sulfate groups existing in the shell matrix significantly increases the Ca binding ability, which in turn may increase both shell percentage and specific gravity and overall shell quality.

CONCLUSION

The results indicate that high energy and high protein (HEHP) diets is suitable for optimum performance of Japanese quail in terms of weight gain and egg quality.

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