Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(4): 1135-1137

Received: 04-05-2018
Accepted: 06-06-2018

Deepika Jain
A.V.F.O., Department of Animal Husbandry, Shivni, Madhya Pradesh, India

RPS Baghel
Dean, College of Veterinary Science and Animal Husbandry, NDVSU, Civil Lines, Jabalpur, Madhya Pradesh, India

Sunil Nayak
Prof and Head, Department of Animal Nutrition, College of Veterinary Science and Animal Husbandry, NDVSU, Civil Lines, Jabalpur, Madhya Pradesh, India

Rajesh Kumar
Teaching Associate, Department of Animal Nutrition, PGIVER Jaipur, Rajasthan, India

AK Patil
Assistant professor, Department of Animal Nutrition, College of Veterinary Science and Animal Husbandry, Mhow, Madhya Pradesh, India

Correspondence
Deepika Jain
A.V.F.O., Department of Animal Husbandry, Shivni, Madhya Pradesh, India

Quality traits of eggs in birds fed diets containing different energy and protein levels with and without fish meal

Deepika Jain, RPS Baghel, Sunil Nayak, Rajesh Kumar and AK Patil

Abstract
The present study was carried out to evaluate quality traits of eggs in birds fed diets containing different energy and protein levels with and without fish meal. Eighty birds divided into eight equal groups (T_1, T_2, T_3, T_4, T_5, T_6, T_7 and T_8). Birds in all the eight groups were fed maize, soybean meal, fish meal (Jawla fish) and deoiled riice polish (DORP). In the present study egg shell thickness was not significantly influenced by the levels of dietary energy and protein. However this research indicated that reduction of protein from 16.5 to 14.5 per cent caused significant ($p<0.05$) decline in egg shell quality at the beginning of the second production cycle in birds. Egg quality traits were not influenced due to diets containing different levels of energy and protein with or without fish meal except yolk index which was significantly higher in birds assigned 16 per cent CP and 2700 kcal ME/kg.

Keywords: Egg, fish meal, quality traits, energy and protein

1. Introduction
Poultry is one of the fastest growing segments of the agricultural sector in India today. It is growing at a much faster rate and accounts for 100 billion rupees to the Gross National Product (GNP). In India, egg production is growing at a compounded annual growth rate of over 8 per cent. The production of agricultural crops has been rising at a rate of 1.5 to 2 per cent per annum while that of eggs is at a rate of 8 to 10 per cent per annum. India although is the world's fifth largest egg producer, its per capita egg consumption is poor i.e. 37 eggs per annum [1]. These levels are too low as compared to the world average of 147 eggs on per capita basis [2]. There is a large variation in the egg consumption among the people of rural and urban areas. Among rural mass, it is only 7.7 per annum in comparison to 17.8 per annum in urban areas. The main source of protein in poultry rations are animal or plant proteins [3]. Vegetable proteins constitute around 30 per cent of total compounded poultry diet. Majority of the vegetable protein sources are deficient in one or more critical amino acids like methionine, lysine, etc [3]. On account of it, a single vegetable protein source cannot be used as a sole source of protein in layer ration. The nutrient requirements of poultry tend to change from one generation to the next because of the applied speed of genetic selection [4]. Several factors influence nutrient requirements of poultry [5]. Efforts are continuously made by the researchers to improve the production potential and efficiency of nutrient utilization in birds.

2. Material and Methods
2.1 Duration of experiment
The experiment was conducted in the department of Animal Nutrition, College of Veterinary Science and Animal Husbandry, Jabalpur, (M.P.). The experiment was conducted for a period of 12 weeks. It was conducted between October to January, 2015 including 3 days metabolic trail.

2.2 Experimental design and dietary treatments
The design of the experiment was completely randomized design. In the beginning of the experiment, one hundred and twenty layer birds were weighed and their egg production was regularly monitored for fifteen days. Eighty birds of average body weights were selected for the experiment. Rests of the birds with higher and lower body weights were rejected. Considering their body weights and egg production, eighty birds were randomly distributed to

eight different groups and were assigned eight different diets. Thus, each diet was offered to ten layer birds.

The experiment consisted of eight dietary treatments. These were containing different levels of energy and protein. In all the diets lysine and methionine amino acids were maintained at least as per [6].The detail description of the dietary treatments is described as follows:

T_1 = CP 14 % and ME 2600 (kcal /kg) without fish meal
T_2 = CP 14 % and ME 2600 (kcal/kg) with fish meal
T_3 = CP 16 % and ME 2600 (kcal/kg) without fish meal
T_4 = CP 16 % and ME 2600 (kcal/kg) with fish meal
T_5 = CP 14 % and ME 2700 (kcal/kg) without fish meal
T_6 = CP 14 % and ME 2700 (kcal/kg) with fish meal
T_7 = CP 16 % and ME 2700 (kcal/kg) without fish meal
T_8 = CP 16 % and ME 2700 (kcal/kg) with fish meal

3. Parameters studied

3.1 Egg Quality Parameters

Following egg quality parameters were recorded from the eggs collected during 40th and 44th weeks of age.

(i) Shape index
(ii) Albumen index
(iii) Yolk index
(iv) Haugh unit score
(v) Shell thickness

(i) Shape index: Maximum length and width of an egg was measured with Varnier caliper up to 0.1 cm. It is depicted in Plate 2.

$$\text{Shape index} = \frac{\text{Maximum width}}{\text{Maximum length}} \text{ x } 100$$

(ii) Albumen index: Albumen index was calculated as per the method of [7]. It is depicted in Plate 3.

$$\text{Albumen index} = \frac{\text{Albumen height}}{\text{Albumen width}} \text{ x } 100$$

(iii) Yolk index: The yolk index was calculated using the method suggested by [8].

$$\text{Yolk index} = \frac{\text{Yolk height}}{\text{Yolk width}} \text{ x } 100$$

(iv) Haugh unit score: Haugh Unit score was determined as per the method described by Haugh [9].

Haugh unit score = $100 \log (H + 7.57 - 1.71 W^{0.37})$

H = Albumen height in millimeters.
W = Weight of eggs in grams.

(v) Shell thickness: For shell thickness, 3 pieces of each egg shell (two from both ends and one from the middle portion of egg) were measured with the help of screw-gauge up to 0.02 mm after correcting for error.

4. Statistical analysis

The data obtained during the experiment was analyzed statistically using completely randomized design as per the procedure described by [10] and differences among the treatments were tested for significance by Duncan [11].

5. Results

Egg quality traits of birds

The egg quality traits of birds on diets with different energy and protein levels without and with fish meal are provided in Table 1. Treatment means of the shape index indicated maximum value in birds assigned T_6 diet, while it was minimum in those allotted T_8 diet, however, differences among treatments were not significant. Similarly, albumin index was maximum in birds fed T_7 diet and minimum in those offered T_3 diet but among different groups differences were not significant. The yolk index was although maximum in birds assigned T_8 diet but statistically it was comparable to those assigned T_2 and T_3 diet. Minimum yolk index was recorded in birds offered T_1 diet. Among the groups assigned T_4, T_5, T_6 and T_7 diets, yolk index did not differ significantly. The Haugh unit score was maximum in birds assigned T_2 diet and minimum in those allotted T_4 diet but among different groups differences were non-significant. Similarly, shell thickness of eggs did not differ significantly among different groups. However, maximum shell thickness was observed in birds raised on T_1 diet while it was minimum in those allotted T_5 diet.

Table 1: Egg quality traits of birds on diets with different energy and protein levels without and with fish meal

T. No	Shape index	Albumin index	Yolk index	Haugh unit score	Shell thickness
T_1	76.43^a	8.66^a	39.74^d	80.61^a	0.354^a
T_2	78.10^a	8.86^a	43.90^{ab}	83.60^a	0.339^a
T_3	76.51^a	8.60^a	44.36^{ab}	82.36^a	0.353^a
T_4	77.77^a	8.76^a	42.18^{bc}	80.38^a	0.339^a
T_5	77.70^a	8.72^a	41.39^{cd}	80.85^a	0.322^a
T_6	78.53^a	8.86^a	40.93^{cd}	81.91^a	0.326^a
T_7	76.40^a	8.89^a	40.22^{cd}	81.12^a	0.350^a
T_8	76.32^a	8.82^a	45.33^a	80.85^a	0.337^a
LSD	2.254	0.221	2.271	3.393	0.049

^{a,b,c,d} Values with similar superscript did not differ significantly (P>0.05)

The comparative egg quality traits of birds on diets with different energy and protein levels without and with fish meal is presented in Table 2. Among the birds assigned diets without fish meal, the shape index, albumin index, Haugh unit score as well as shell thickness among different groups of birds did not differ significantly and among different parameters, values were not much different. As regards yolk index, values were maximum and significantly higher in birds assigned T_3 diet in comparison to other groups. Among remaining three groups (T_1, T_5 and T_7), differences were not significant.

Table 2: Comparative egg quality traits of birds on diets with different energy and protein levels without and with fish meal

T. No	CP/ME	Shape index	Albumin index	Yolk index	Haugh unit score	Shell thickness
Without fish meal						
1	14/2600	76.43 [a]	8.66 [a]	39.74[d]	80.61[a]	0.354[a]
5	14/2700	77.70 [a]	8.72 [a]	41.39[cd]	80.85[a]	0.322 [a]
3	16/2600	76.51 [a]	8.6 0 [a]	44.36[ab]	82.36[a]	0.353 [a]
7	16/2700	76.40 [a]	8.89 [a]	40.22[cd]	81.12[a]	0.350 [a]
With fish meal						
2	14/2600	78.10 [a]	8.86 [a]	43.90[ab]	83.60[a]	0.339[a]
6	14/2700	78.53 [a]	8.86 [a]	40.93[cd]	81.91[a]	0.326[a]
4	16/2600	77.77 [a]	8.76 [a]	42.18[bc]	80.38[a]	0.339[a]
8	16/2700	76.32 [a]	8.82 [a]	45.33[a]	80.85[a]	0.337[a]
	LSD	2.254	0.221	2.271	3.393	0.049

[a,b,c,d] Values with similar superscript did not differ significantly (P>0.05)

Among the birds assigned fishmeal diets, the shape index, albumin index, Haugh unit score as well as shell thickness did not differ significantly. The yolk index was maximum in birds assigned T_8 diet but it was statistically comparable with those allotted T_2 diet. Significantly (p<0.05) lower yolk index was observed in groups fed T_6 diet.

6. Discussion

In the present study, with 14 or 16 per cent CP diet, use of NRC (1994) level of lysine and methionine did not influence the egg quality traits except the yolk index which was significantly (p<0.05) higher in birds assigned 16 per cent protein and 2700 kcal ME/kg with fish meal. *El-Maksoud et al.* [12] also observed that best value of egg shape index and Haugh unit score was obtained with 12 per cent CP diet supplemented with amino acid. While, the best yolk weight values were for 14 per cent CP as well as 14 per cent CP supplemented with AA diet. But the best yolk index value was obtained in birds assigned 14 per cent CP diet supplemented with amino acid. *Rama Rao et al.* [13] observed that dietary concentrations of CP had no effect on egg weight (EW), egg mass (EM), except the egg weight during the initial 3 periods, which was significantly lower in layers fed 15 per cent CP. However, egg weight and EM increased nonlinearly and linearly, respectively, with increasing dietary concentrations of lysine. They also observed that increasing methionine concentrations increased the egg weight nonlinearly but had no influence on EP, shell defects, and BW.

In the present study egg shell thickness was not significantly influenced by the levels of dietary energy and protein. However, [14] indicated that reduction of protein from 16.5 to 14.5 per cent caused significant (p<0.05) decline in egg shell quality at the beginning of the second production cycle in birds.

7. Conclusion

Egg quality traits were not influenced due to diets containing different levels of energy and protein with or without fish meal except yolk index which was significantly higher in birds assigned 16 per cent CP and 2700 kcal ME/kg.

8. Suggestions for further work

Studies should be conducted to evaluate the minimum requirement of protein and energy with supplementation of different essential amino acids in layers.

9. Acknowledgement

Authors are thankful to Dean, NDVSU, Jabalpur, (M.P.) for providing all invaluable insights and regular encouragement throughout the whole study period.

10. References

1. Mehta R. WTO and Indian Poultry Sector: Lessons from State Support Measures in Select Countries. Research and Information System for the Non-Aligned and Other Developing Countries, New Delhi, India. 2002.
2. Food and Agriculture Organization (www.fao.org). FAOSTAT.
3. Adeyemo GO, Abioye SA, Aderemi FA. The effect of varied dietary crude protein levels with balanced amino acids on performance and egg quality characteristics of layer at first laying phase. Food and Nutrition Sciences. 2012; 3:526-529
4. McDonald P, Edwards RA, Greenhalgh JFD. Animal Nutrition, 6th Edition. Longman, London and New York. 2002, 543.
5. Mandal AB, Praveen Tyagi K, Srivastav AK. Research Priorities in Poultry Nutrition and Feed Technology to 2020. In: Poultry Research Priorities to. 2020. 2006, 97-114.
6. NRC. Nutrient Requirements of Poultry.9th revised *edition*. National Academy Press, Washington, DC, 1994.
7. Heiman V, Carver JS. The albumen index as measurement of observed egg quality. Poultry Science. 1936; 74:141-148.
8. Funk FM. The relation of yolk index determined after separating the yolk from albumin. Poultry Science. 1948; 27:367.
9. Haugh RR. The Haugh unit for measuring egg quality. Egg and Poultry magazine. 1937; 43:552-555.
10. Snedecor GW, Cochran WG. Statistical methods. 6th Edn, Oxford and IBH Publication Co. Pvt. New Delhi, 1980.
11. Duncan DB. Multiple range and multiple F tests. Biometrics. 1995; 11:1-42.
12. El-Maksoud A, El-Sheikh SM, Salama AA, Khidr RE. Performance of local laying hens as affected by low protein diets and amino acids supplementation. Egyptian Poultry Science. 2011; 31:249-258.
13. Rama Rao SV, Ravindran V, Srilatha T, Panda AK, Raju MVLN. Effect of dietary concentrations of energy, crude protein, lysine, and methionine on the performance of White Leghorn layers in the tropics. Journal of Applied Poultry Research. 2011; 20:528-541.
14. Mendonca CX, Lima FR. Effect of dietary protein and methionine levels on forced molted performance of laying hens. Brazilian Journal Veterinary Research Animal Science. 1999; 36:332-338.