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Effect of dietary supplementation of Chlorella vulgaris (green microalgae) on egg quality characteristics of Japanese quail

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ABSTRACT

The present study was designed to evaluate the egg quality characteristics of Japanese quail fed *Chlorella vulgaris* algae containing diets. An experimental diet containing 5 levels of *Chlorella vulgaris* powder (0.0, 0.5, 1.0, 2.0 and 4.0%) from 6 to 13 weeks of age. A total number of 120 female quails were randomly divided into five dietary treatments (3 replicates of 24 birds per treatment) and reared under cage system. Egg quality characteristics showed absence of effects viz. egg weight, albumen index, yolk index, haugh unit, per cent shell weight, mean shell thickness. In egg laying quails, *C. vulgaris* supplemented feed intake in 6-13 weeks of age at 5 g per kg of feed was found to improve egg production and there was no influence of feed in egg quality.

Keyword: egg quality, egg weight, albumen index, yolk index.

1. INTRODUCTION

A number of animal sciences institutions have recognized the potential of J.quail as an egg and meat producing bird and as a result initiated the commercial farming of Japanese quails for its farming-friendly factors such as low floor space, feed requirements, early maturity, high egg production, high disease resistance and low financial investment. Other countries such as China, Italy, Russia and the United States also have established commercial Japanese quail farming industries. J.quail provides developing countries with a stable source of proteins and developing countries with a suitable alternative to chicken (Asha, 2011).

Microalgae are an enormous biological resource, representing one of the most promising sources for new products and applications (Pulz and Gross, 2004). They can be used to enhance the nutritional value of food and animal feed, due to their well balanced chemical composition. Moreover, they are cultivated as a source of highly valuable molecules such as polyunsaturated fatty acids, pigments, antioxidants, pharmaceuticals and other biologically active compounds. The application of microalgae biomass and metabolites is an interesting and innovative approach for the development of healthier food products.

2. MATERIALS AND METHODS

The biological experiment was carried out in the Poultry farm complex, Department of Poultry Science, Veterinary College and Research Institute (VCRI), Namakkal, Tamilnadu Veterinary and Animal Sciences University (TANUVAS). To study the effect of dietary supplementation of green microalgae (*Chlorella vulgaris*) on egg quality characteristics of Japanese quail (*Coturnix coturnix japonica*). The green micro algae, *Chlorella vulgaris* in

dried form used in this study was procured from the National Institute of Ocean Technology (NIOT), Pallikaranai, Chennai.

Experimental design and allocation of quails

In this experiment, 24 female birds were randomly selected from each treatment group and were reared under cage system to study the effect of feeding *Chlorell*a *vulgaris* on laying performance from 6 to 13 weeks of age.

The experimental design consisted of five treatment groups with three replicates of 8 female quails each. The quails were fed with experimental diets by incorporating 0, 0.5, 1.0, 2.0 and 4.0 percent *Chlorella vulgaris* algae.

Egg quality studies

Japanese quails egg quality characteristics was performed to examine certain traits, including shell weight, shape index, specific gravity, shell thickness, Haugh unit (Haugh, 1937), yolk index and yolk colour by using the Roche yolk colour fan.

Statistical analysis

The data collected in all the above biological experiments of this study were subjected to analysis of variance procedure of Statistical Analytical System (SPSS version 20). When significant differences were noticed, Duncan multiple range test was used to separate its mean values.

3. RESULTS AND DISCUSSION

Egg weight

The egg weight of Japanese quails fed diets containing *Chlorella vulgaris* did not show any difference when compared with the control (Table- 1). No earlier research work was available to compare or discuss about Japanese quail egg weight. Similar results pertaining to egg weight were reported in chicken by Svetlana Grigorova (2005) and Yang *et al.* (2006).

Egg quality studies

Japanese quails egg quality characteristics viz. shell weight, shape index, specific gravity, shell thickness, Haugh unit, yolk index and yolk colour was not significantly different between control and *C. vulgaris* treated quails (table- 2). Albumen index alone showed significant ($P < 0.05$) difference. Increase in the algae level showed increase in the albumen index. Yolk colour was increased as the *C. vulgaris* level in the diet increased. No significant effect on egg weight of laying chicken was reported by Yang *et al.* (2006). Ross and Dominy (1990) found that the egg quality of Japanese quails fed diets containing *Spirulina* was not different from control and this is in agreement with *Chlorella vulgaris*. Zheng *et al.* (2012) fed *Chlorella* in hens recorded higher haugh unit. Yang *et al.* (2006) recorded laying hens fed

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algae obtained improved egg quality but no significant difference in haugh unit. But Anonym (1998) obtained positive effect on egg quality of hens fed *Spirulina*. Zheng *et al.* (2012) studied in hens by feeding *Chlorella* found no significant difference in egg shell colour and thickness. Algae with DL methionine also has not produced any difference in egg shell quality of laying hens (Bianka Lipsteina *et al.*, 2007).

Feeding of *Spirulina* or algae in laying hens has improved yolk colour as reported by Ross and Dominy (1990), Zheng *et al.* (2012), Bianka Lipsteina *et al.* (2007), Svetlana Grigorova (2005), Lipstein *et al.* (1980), Arakawa *et al.* (1960), Yang *et al.* (2006), Nimruzu (2002), Ginzberg *et al.* (2000) and Saxena *et al.* (1983). They found that the yolk colour improved with increased algae level in the feed.

4. CONCLUSION

In egg laying quails, *C. vulgaris* supplemented feed intake in 6-13 weeks of age at 5 g per kg of feed was found to improve egg production and there was no influence of feed in egg quality.

Table 1 Effect of dietary supplementation of *Chlorella vulgaris* (green microalgae) in Japanese quail on egg weight (Mean ± SE)

Treatment/ Egg weight[NS] (g)	***Chlorella vulgaris* (%)**				
	Control	**0.5**	**1.0**	**2.0**	**4.0**
	12.65 ±0.19	12.31 ±0.16	12.56 ±0.32	12.36 ±0.19	12.35 ±0.05
n	588	737	528	575	449

[NS] Not significant

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Table 2 Effect of dietary supplementation of *Chlorella vulgaris* (green microalgae) in Japanese quail on egg quality characteristics (Mean ± SE)

Treatment / egg quality characteristics	*Chlorella vulgaris* (%)				
	Control	**0.5**	**1.0**	**2.0**	**4.0**
Shell weight* (per cent)	11.91^{a} ±.15	12.12^{ab} ±0.20	12.85^{b} ±0.29	12.64^{ab} ±0.22	12.84^{b} ±0.50
Shape index^{NS}	78.47 ±1.15	80.57 ±0.57	79.90 ±0.73	79.05 ±0.85	77.27 ±2.33
Specific gravity^{NS}	1.09 ±0.009	1.09 ±0.008	1.11 ±0.011	1.09 ±0.009	1.07 ±0.03
Shell thickness^{NS} (mm)	0.17 ±0.009	0.16 ±0.003	0.17 ±0.006	0.17 ±0.003	0.17 ±0.006
Albumen index*	0.09^{a} ±0.003	0.09^{a} ±0.003	0.09^{a} ±0.002	0.10^{b} ±0.003	0.11^{b} ±0.005
Haugh unit^{NS}	85.42 ±0.76	87.71 ±0.70	85.95 ±0.49	87.29 ±0.57	86.39 ±2.56
Yolk index^{NS}	0.40 ±0.009	0.43 ±0.007	0.42 ±0.006	0.41 ±0.008	0.41 ±0.013
Yolk colour^{NS}	4.56 ±0.097	4.56 ±0.097	4.64 ±0.10	4.99 ±0.14	4.85 ±0.26

n = 36 per treatment

^{NS} Non significant * Significant ($P < 0.05$)

Values bearing same superscripts in the same row do not differ significantly

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