

EFFECT OF DIETARY SUPPLEMENTATION OF *CHLORELLA VULGARIS* (GREEN MICROALGAE) ON SERUM BIOCHEMICAL PARAMETERS OF JAPANESE QUAIL

Anjalai. K¹, Revathi. K², Vidhya. G³, Kirubakaran. R⁴ & Babu. M⁵

^{1,2,3}Resear Scholar, Department of Zoology, Ethiraj College for Women, Chennai, Tamil Nadu, India

⁴National Institute of Ocean Technology (NIOT), Chennai, Tamil Nadu, India

⁵Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), Chennai, Tamil Nadu, India

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ABSTRACT

The serum biochemical profile of the Japanese quail was estimated the parameters which were evaluated include serum cholesterol, triglycerides (TGL), total proteins, albumin, globulin, and glucose. The major focus in research is to provide a nutritional feed alternative which ensures the health of the animals. The nutritional preparations along with the algae (*Chlorella vulgaris*) in powdered form was incorporated in (control, 5g, 1g, 20g & 40g *Chlorella vulgaris* per kg of feed) the basal diet of Japanese quail. The biochemical profile showed changes in the level with age of the Japanese quails fed with *Chlorella vulgaris*. Ageing increased cholesterol and triglyceride level. Increasing algae level proportionately reduced the cholesterol and triglyceride level. The total proteins, albumin, globulin and glucose content of the quails fed with *Chlorella vulgaris* increased with age.

KEYWORDS: Serum Biochemistry, *Chlorella Vulgaris*, Japanese Quail

INTRODUCTION

Chlorella a green microalgae containing abundant chlorophyll is known as functional food worldwide. It is a good source of protein, lipid, carotenoids, vitamins, minerals, pigment (Kay, 1991), and contains essential amino acids in excellent ratios (Borowitzka, 1988; Schubert, 1988). Additionally, in experimental animals, it affects growth rate (Konishi *et al.*, 1996), and lipid contents in the liver and serum (Shibata *et al.*, 2001). Japanese quail (*Coturnix coturnix japonica*) farming is coming up as a diversification of poultry farming. Quails possess an excellent disease resistance quality than those of chickens and have been chosen for its economical viability in farming (Deka and Borah, 2008). The blood biochemical analysis is a valuable tool for evaluating the health of the animal.

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, Tamil Nadu Veterinary and Animal Sciences University (TANUVAS) for a period of 13 weeks from day old to 13 weeks of age to study the effect of dietary supplementation of green microalgae (*Chlorella vulgaris*) on the serum biochemical performance of Japanese quail (*Coturnix coturnix japonica*). The green microalgae, *Chlorella vulgaris* in the dried form used in this study were procured

from the National Institute of Ocean Technology (NIOT), Pallikaranai, Chennai. The experimental diet was supplemented with 0.5 %, 1%, 2 % and 4 % of *Chlorella vulgaris* per kg of feed. Control diet had no *Chlorella vulgaris*.

Three hundred numbers of one day old Namakkal quail 1 strain of Japanese quail chicks belonging to a single hatch was obtained from the Department of Poultry Science hatchery, VCRI, Namakkal. The Japanese quail chicks were weighed individually and randomly distributed into five treatments. Each treatment had three replicates of 20 chicks each.

Serum Biochemical Parameters

The blood samples were collected in test tubes and centrifuged at 2500 rpm for 15 minutes to separate the clear serum using a microcentrifuge. Serum samples were stored at -20°C for the estimation of serum cholesterol, triglycerides (TGL), total proteins, albumin, globulin and glucose as per standard procedures. The absorbances were measured by using UV- Visible Spectrophotometer.

The data were collected subjected to analysis of variance procedure of the Statistical Analytical System (SPSS version 20). When significant differences were noticed, Duncan multiple range tests were used to separate its mean values.

RESULTS AND DISCUSSIONS

Serum biochemical parameters viz. total cholesterol, triglycerides, total protein, albumin, globulin, and glucose were analyzed during fifth and thirteenth week of age in Japanese quails fed diets containing *Chlorella vulgaris* at 0, 0.5, 1.0, 2.0 and 4.0 per cent levels showed highly significant ($P < 0.01$) difference except for albumin which showed significant ($P < 0.05$) difference at fifth week of age.

Chlorella vulgaris supplementation significantly ($P < 0.01$) reduced cholesterol level in Japanese quails at the fifth and thirteenth week of age. Ageing increased cholesterol level. At the fifth week of age cholesterol level decreased from 185.33 mg / dL in control quails to 169.33 mg / dL in 0.5 per cent *Chlorella vulgaris* fed quails, 164.00 mg / dL in 1.0 per cent, 158.67 mg /dL in 2.0 per cent and 153.33 mg / dL in 4.0 per cent algae treatment. Increasing the algae level proportionately reduced the cholesterol level. Similar trend was observed at the thirteenth week of age, algae supplementation in feed beyond 0.5 per cent i.e. 1.0, 2.0 or 4.0 per cent significantly ($P < 0.01$) reduced the cholesterol level from control 190.28 and 0.5 per cent 181.94 mg / dL to 168.06, 165.28 and 166.67 mg / dL in 1.0, 2.0 and 4.0 per cent algae fed Japanese quails

Serum triglycerides levels also showed the similar trend as cholesterol level. Both fifth and thirteenth week of age increasing algae dose (*Chlorella vulgaris*) in the diet proportionately reduced triglycerides level in Japanese quails. Ageing increased triglycerides level. At fifth week, 2.0 and 4.0 per cent algae fed quails significantly ($P < 0.01$) reduced triglycerides to 87.41 and 77.04 mg / dL respectively, than 1.0 and 0.5 per cent algae fed quails (98.15 and 103.70 mg / dL) and also in control (111.11 mg / dL) quails. In thirteenth week old Japanese quails 2.0 and 4.0 per cent algae significantly ($P < 0.01$) reduced triglycerides to 96.00 and 85.54 mg / dL than 1.0 and 0.5 per cent algae fed quails (108.46 and 123.75 mg / dL) and control (137.50 mg / dl) quails. Serum protein level significantly ($P < 0.01$) increased in algae fed quails (3.48 to 3.78 g / dL) than control (2.86 g / dL) at the fifth week of age. Ageing increased serum protein level. At the thirteenth week of age, algae supplementation increased serum protein level (4.24 to 5.69 g / dL) than control (3.79 g / dL) quails. Serum albumin level (1.99 to 2.14 g / dL) than control (1.91 g / dL) at fifth week and also at thirteenth

week of age (control 1.74 g / dL and 1.96 to 3.51 g / dL) in algae fed quails. Albumin level decreased as age advanced in control and 0.5 per cent algae level

Serum globulin level increased with *Chlorella vulgaris* algae supplementation than control at the fifth week of age. At thirteenth week of age, algae at 0.5 and 1.0 per cent level increased globulin level 2.82 and 3.24 g / dL than control (2.05 g / dL). Algae at 2.0 and 4.0 per cent, significantly (P < 0.01) reduced serum globulin to 0.97 and 0.77 g / dL respectively

Serum glucose level in Japanese quails was significantly (P < 0.01) increased by dietary supplementation of *Chlorella vulgaris* algae at fifth and thirteenth week of age. At the fifth week, the serum glucose levels recorded were 70.24 to 80.95 mg / dL in algae fed quails than 57.14 mg / dL in control. Similarly, in thirteenth week age quails, the serum glucose levels were 93.33 to 96.67 mg / dL in algae supplemented treatments than 86.67 mg / dL in control quails. A similar result was obtained by Mariey *et al.* (2014), Alaeldein *et al.* (2013), El-Deek *et al.* (2011) and Venkataraman *et al.* (1994) on broilers and in hens by Mariey *et al.* (2012).

Serum biochemical studies showed significant increase in serum protein, albumin, globulin and glucose up to 4 per cent *C. vulgaris* fed Japanese quails. Serum cholesterol and triglycerides showed significant decrease up to 4 per cent *C. vulgaris* fed Japanese quails.

Table 1: Effect of Dietary Supplementation of *Chlorella Vulgaris* (Green Microalgae) on Serum Biochemical Parameters of Japanese Quail (Mean ± SE)

Treatment/ Serum Biochemical Parameters		<i>Chlorella Vulgaris</i> (%)				
		Control	0.5	1.0	2.0	4.0
Cholesterol (mg/dL)	Fifth week**	185.33 ^c ±3.21	169.33 ^b ±3.21	164.00 ^{ab} ±5.37	158.67 ^{ab} ±2.46	153.33 ^a ±1.33
	Thirteenth week**	190.28 ^b ±5.86	181.94 ^{ab} ±2.56	168.06 ^a ±3.98	165.28 ^a ±5.01	166.67 ^a ±4.30
Triglyceride (mg/dL)	Fifth week**	111.11 ^b ±8.11	103.70 ^b ±7.41	98.15 ^{ab} ±5.78	87.41 ^{ab} ±4.39	77.04 ^a ±4.43
	Thirteenth week**	137.50 ^d ±4.56	123.75 ^{cd} ±1.55	108.46 ^{bc} ±5.65	94.58 ^{ab} ±5.58	86.79 ^a ±4.71
Protein (g/dL)	Fifth week**	2.86 ^a ±0.08	3.48 ^b ±0.10	3.87 ^b ±0.09	3.56 ^b ±0.15	3.56 ^b ±0.20
	Thirteenth week**	3.79 ^a ±0.19	4.78 ^b ±0.33	5.69 ^c ±0.30	4.33 ^{ab} ±0.31	4.24 ^{ab} ±0.22
Albumin (g/dL)	Fifth week*	1.91 ^a ±0.09	2.14 ^b ±0.03	2.08 ^{ab} ±0.06	1.99 ^{ab} ±0.06	2.11 ^{ab} ±0.09
	Thirteenth week**	1.74 ^a ±0.02	1.96 ^b ±0.07	2.45 ^c ±0.06	3.36 ^c ±0.08	3.51 ^c ±0.07
Globulin (g/dL)	Fifth week**	0.96 ^a ±0.08	1.34 ^{ab} ±0.12	1.79 ^b ±0.09	1.57 ^{ab} ±0.15	1.45 ^{ab} ±0.24
	Thirteenth week**	2.05 ^b ±0.21	2.82 ^{bc} ±0.32	3.24 ^c ±0.32	0.97 ^a ±0.26	0.77 ^a ±0.19
Glucose (mg/dL)	Fifth week**	57.14 ^a ±2.61	70.24 ^{ab} ±3.41	80.95 ^b ±5.43	78.57 ^b ±4.52	75.00 ^b ±4.79
	Thirteenth week*	86.67 ^a ±1.67	96.67 ^b ±1.67	95.00 ^b ±2.24	93.33 ^{ab} ±2.47	96.67 ^b ±4.01

n = 6 per treatment

* Significant (P < 0.05) ** Highly significant (P < 0.01)

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

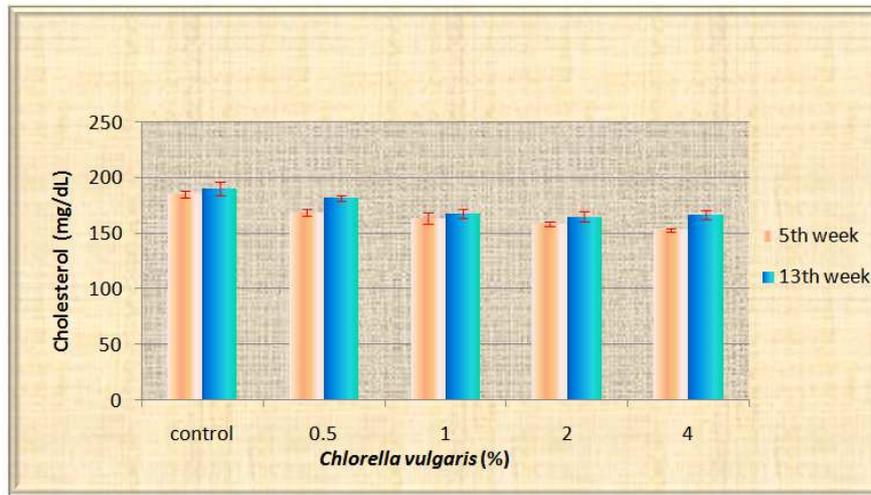


Figure 1: Effect of Dietary Supplementation of *Chlorella Vulgaris* on Serum Cholesterol (mg/dL) of Japanese Quail (Mean ± SE)

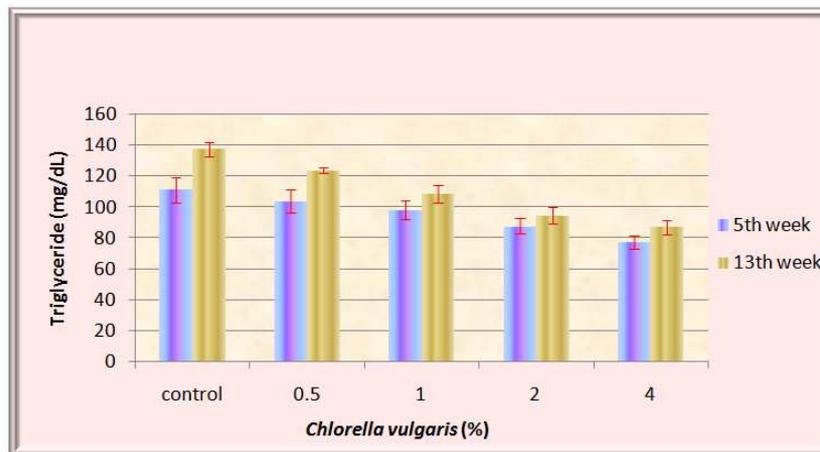


Figure 2: Effect of Dietary Supplementation of *Chlorella Vulgaris* on Serum Triglyceride (mg/dL) of Japanese Quail (Mean ± SE)

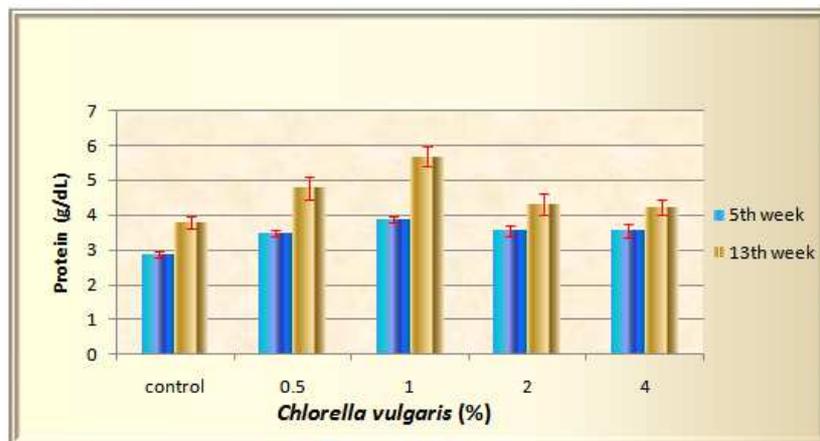


Figure 3: Effect of Dietary Supplementation of *Chlorella Vulgaris* on Serum Protein (g/dL) of Japanese Quail (Mean ± SE)

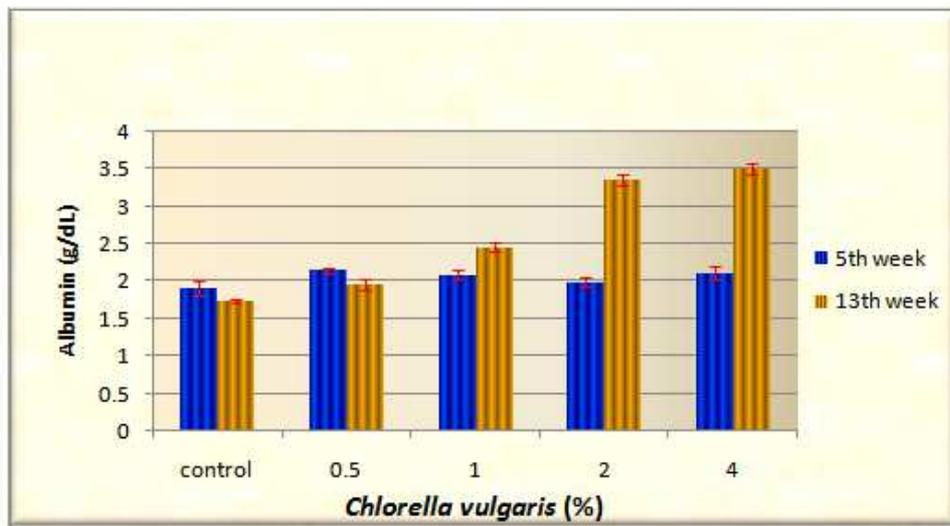


Figure 4: Effect of Dietary Supplementation of *Chlorella Vulgaris* on Serum Albumin (g/dL) of Japanese Quail (Mean \pm SE)

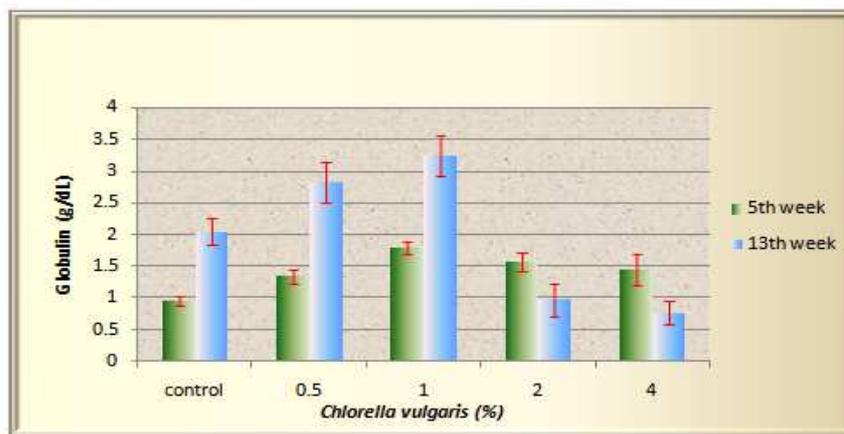


Figure 5: Effect of Dietary Supplementation of *Chlorella Vulgaris* on Serum Globulin (g/dL) of Japanese Quail (Mean \pm SE)

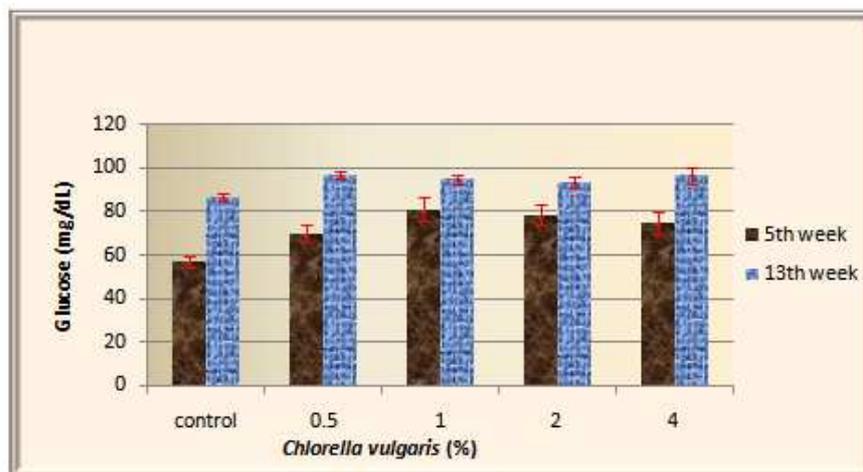


Figure 6: Effect of Dietary Supplementation of *Chlorella Vulgaris* on Serum Glucose (mg/dL) of Japanese Quail (Mean \pm SE)

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