REPRODUCTIVE, SERUM BIOCHEMICAL AND HORMONAL TRAITS OF LOCAL QUAIL IN RESPONSE TO DIETARY SUPPLEMENTATION OF GREEN TEA POWDER

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ABSTRACT

This study was conducted on 90 local quail females in six different treatments in order to know the effect of adding green tea powder to the quail diet on the productive, reproductive, biochemical and hormonal characteristics of quail females. The results showed a significant superiority of the birds of the group fed on 1% of green tea powder in hot and cold carcass weight, average egg weight, albumin weight, yolk height and color, and the lowest feed consumption, while the control-treated birds in the number of eggs produced, HDP, ALT, Alkaline and Bilirubin exceeded the other treatments birds. Concerning the lipid profile, blood urea ratio, and AST, the highest significant figures were recorded in the treatment of birds fed a ration to which 3% lipids were added. In contrast, the lowest values for total cholesterol, Tri, VLDL, and blood nitrogen were recorded for birds of the treatment fed at 2% of green tea powder. The results showed that there were significant differences between the six treatment birds in the level of blood hormones, as the highest level of (estrogen), (Ghrelin, leptin, FSH), (T4) and (Growth and LH) were recorded for the control birds, 3% lipid and 1% dried green tea and 2% green tea with 3% lipid, respectively. We conclude from the above that birds fed a supplemented diet of 1% green tea powder were superior in most productive and reproductive traits, especially carcass weight, dressed %, egg weight and internal egg characteristics, compared to other treated birds.

Keywords: local quail, reproductive trait, hormonal levels, biochemical traits.

أضافة مسحوق الشاي الأخضرلعليقة السمان المحلي وتأثيره على الصفات التناسلية والبايوكيمياوية و الهرمونية

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المستخلص

أجريت هذه الدراسة على 90 أنثى من السمان المحلي في ستة معاملات مختلفة بهدف معرفة تأثير إضافة مسحوق الشاي الأخضر إلى عليقة السمان على الخصائص الإنتاجية والتناسلية والبيوكيميائية والهرمونية لإناث السمان. أظهرت النتائج تفوقاً معنوياً لطيور المجموعة التي تغذت على 1٪ من مسحوق الشاي الأخضر في وزن الذبيحة الحارة والباردة ، ومتوسط وزن البيض ، ووزن الألبومين ، وأرتفاع الصفار ولون الصفار ، وأقل استهلاك علف ، بينما تفوقت طيور معاملة السيطرة في عدد البيض المنتج ، والنسبة المئوية لأنتاج البيض على الطيور المعاملات الأخرى. فيما يتعلق بملف الدهون ، ونسبة اليوريا في الدم ، و AST ، تم تسجيل أعلى الأرقام المعنوية في معاملة الطيور التي تم تغذيتها على عليقة مضافة اليها 3٪ دهون. في المقابل ، سجلت أدنى قيم للكوليسترول الكلي ، ثلاثي ، VLDL ، ونتروجين الدم لطيور المعاملة التي تمت تغذيتها بنسبة 2٪ من مسحوق الشاي الأخضر. أظهرت النتائج وجود فروقات معنوية بين الطيور المعاملات الستة في مستوى هرمونات الدم حيث تم تسجيل أعلى مستوى من (Estradiol)و (Ghrelin ، Leptin ، FSH) و (T4) و (LH ، Growth) لكل من معاملة السيطرة ، 3٪ دهون و 1٪ شاي أخضر و 2٪ شاي أخضر مع 3٪ دهون ، على التوالي. نستنتج مما سبق أن الطيور التي تغذت على غذاء مكمل بنسبة 1٪ مسحوق الشاي الأخضر كانت متفوقة في معظم الصفات الإنتاجية والتناسلية ، خاصة وزن الذبيحة ونسبة التصافي ووزن البيض وخصائص البيض الداخلي ، مقارنة بالطيور المعاملات الأخرى.

كلمات مفتاحية: السمان المحلي ، الصفات التكاثرية ، المستويات الهرمونية ، الصفات البيوكيميائية.

INTRODUCTION

Shen Nung, a Chinese ruler, discovered tea by accident in 2737 BC (1). The tea plant (*Camellia sinensis L.*) is a perennial, evergreen, cross-pollinated plant with white flowers and two to three seeded green. The flavor, color, and name of the tea are all determined by how the leaves are processed. There are four different kinds of tea: oolong tea (tea leaves that have been exposed to the air and allowed to fully oxidize or ferment, turning the leaves from green to black); black tea (tea leaves that have been exposed to the air and allowed to fully oxidize or ferment, turning the leaves from green to black) (it falls between black and green tea); white tea (less processed and fermented); and green tea (less processed and fermented), (the least processed of all teas). Green tea polyphenols have been demonstrated to increase body weight gain and feed efficiency in birds (2). Green tea polyphenols have been shown to have substantial anti-oxidant capabilities (3), as evidenced by a decrease in thiobarbituric acid reactive substances values and the oxidative stability of poultry meat (4) and egg yolk (3 and 5) Green tea leaves, by-products, and tea polyphenols can be added to broiler feed to reduce mortality in birds (6) and to hen feed to improve laying performance and lower cholesterol levels in eggs (5 and 7). According to (4) When birds were fed varying doses of green tea by-products, cholesterol levels were reduced and plasma and meat fatty acids were improved. Green tea and its derivatives, including as green tea extract, green tea leaves, green tea by-products, green tea polyphenols, and green tea flowers, are added to bird's diets to improve performance. The purpose of this paper was to evaluate the addition of several levels of green tea powder to quail rations on quail growth, egg production, serum profile and levels of blood hormones that affect the productive efficiency of domestic female's quail (*Coturnix coturnix*).

MATERIALS AND METHODS

Birds and treatments

Ninety 35-day old female local quail used in the study. The quails were divided randomly to six (Control, 3% lipid, 1% power green tea, 1% powder green tea + 3% lipid, 2% powder green tea and 2% powder green tea + 3% lipid) groups (15 bird/group) were kept together in individual cages. The birds were housed in 6 cages and each cage housed 15 quails. The dimension for the cages was 100cm × 45cm × 25 cm (length, width, height). Feed and water were supplied adlibitum. The experimental diet contained 22% protein and 2950 K cal – ME / Kg from 35 days of age to the end of experimental and light provided for 24 hours. The quail were fed the brooder/grower diets for 5 weeks and after that the birds were fed with six different diets in terms of additives, the 1st group was fed on the same upper diet without additives, the 2nd group was fed with a percentage of which 3% of lipid was added, the 3rd group was added to their diet 1% of dried green tea powder, the 4th group was added 1% of dried green tea powder with 3% lipids, the 5th group fed a ration, 2% of dried green tea powder was added and the 6th group, 2% dried green tea powder with 3% lipids to the end of experimental.

Body weight

Live body weights (BW) of quail chicks for each group were weighted (gm) monthly using sensitive electronic scale (accuracy up to 1 gm) until 4 month of age.

Carcass traits

The quails from each group were slaughtered at 4 month of age, after 4-hour fasting, but given enough water. The quails were individually weighed and slaughtered by cutting the jugular vein. Blood from each quail was collected for physiology analysis according to the procedure of (8) as described by (9). The birds are then properly bled (about 4 minutes) and feathers removed manually. calculations of dressed percentage were obtained according to the procedure and formulae of (10). The dressed % calculated according to following equation:

Dressed (%) = (Carcass weight /Live weight) x 100.

Egg production

The egg weight (gm) and egg numbers (collected eggs) were recorded daily, from the first day of sexual maturity (5% of birds laid eggs), and continued up to end of experimental, the egg for each quail hens were taken using sensitive electronic scale. The Hen-Day Egg Production HDEP % and egg

number /bird were calculated according to the following equations:

(a)- Part-lay Hen Day Production (% HDEP)

HDEP %= (Total number of eggs produced on a day/Total number of hens present on that day) *100 …. (11)

Feed intake (FI) and feed conversion ratio (FCR) were measured; also HDEP% egg production percentage was calculated throughout the experiment. At the six times of experiment eggs were taken from each treatment groups for the purpose of evaluation egg quality measurements egg weight (by 0.0g sensitive digital scale), yolk height (mm), Albumin height, Haugh unit, yolk color (by yolk color fan 1-16) and breaking strength test for egg shell by (Egg Shell Strength Tester g/ cm2). Measurements of the internal components were obtained by carefully making an opening around the sharp end of the egg, large enough to allow passage of both the albumen and the yolk through it without mixing their contents together. Then carefully the yolk separated from the albumen and placed in a Petri-dish for weighing. Simultaneously, the associated albumen is placed on another Petri dish and weighed. The yolk and albumin height of the egg were measured with electronic caliper. The shell weight with membrane was obtained by carefully placing the opened part in the shell and weighing on the electronic scale. The shell thickness (mm) with intact membranes were measured at three deferent points and the average of the broad, sharp and middle part of the egg were obtained by using the electronic digital Vernier caliper according to (12).

(feed g/egg) = (Feed intake (g / bird))/ ((Egg production (egg weight))

Haugh Unit = 100 Log (H + 7.57 – 1.7 $^{w\ 0.37}$)

As: H = albumin height (mm), w = egg weight (g) (13).

Biochemical analysis

After termination of the trial, 5 quail were collected randomly for blood sampling of each treatment. Blood samples were collected from jugular vein of each bird (total = 30) in sterile tubes and transferred to laboratory for further processing. The blood sera of the collected samples were separated by centrifugation at 3,000 rpm for 10 min and poured into aseptic vials and stored at −20◦C in deep freezer for further analysis. The serum glucose concentrations, urea, lipids (total cholesterol, concentration of serum high-density lipoproteins HDL, concentration of serum high-density lipoproteins HDL and triglycerides), creatinine, bilirubin, uric acid and liver enzymes such as alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were determined according to (14) using available commercial diagnostic kits by used COBAS INTEGRA® 400 plus (Switzerland). However, hormones such as tri-iodothyronine (T3), thyroxin (T4), estrogen, growth hormone (GH), Follicle-stimulating hormone (FSH), Luteinizing Hormone (LH), leptin and ghrelin were analyzed by ELX800 Absorbance Microplate reader, 400 to 750 nm, 96 well (BioTek Instruments, USA).

Statistical Analysis

To analyze the data for quail's traits, the PROC GLM (General Linear Model) procedure (15) was utilized with the following model:

$$Y_{ij} = \mu + T_i + \varepsilon_{ij}$$

Where: Y ij= Study traits of i th treatments (I, i=1, Control, i=2, High lipids 3% , i=3, 1% power green tea, i=4, 1% powder green tea + 3% lipid, i=5, 2% powder green tea and i=6, 2% powder green tea + 3% lipid, μ = Population mean; ε_{ij} = random error. It was assumed to be independently and normally distributed with mean zero and variance $\delta^2 e$. Duncan multiplied range test used to compared among treatments mean.

RESULTS AND DISCUSSION

Growth traits

The results of the statistical analysis in Table (1) indicate that there were no significant differences in the live body weight of the six treatment birds at the start and end of the experiment, while the birds fed on 1% of green tea powder significantly (P≤0.05) outperformed the hot and cold carcass weight of 138.58 and 137.76 g/bird, respectively. Supplemental green tea powder tended to decrease feed intake and body weight gain at a higher dose, but tended to improve FCR. Dressing percentage was affected by green tea.

These findings matched those of (2), who introduced four levels of green tea powder to broiler starter and finisher diets (0.5, 0.75, 1, and 1.5 percent). According to (16), adding 1, 2.50, and 5 percent green tea to broiler diets reduced body weight gain linearly. Similarly, (17) found that supplementing broiler diets with 1 to 1.5 percent green tea reduced the chicks' body weight gain. (4) established the optimal level of green tea by-product (0.5, 1 and 2 percent) in antibiotic-free diets for broiler performance. (6) found that body weight gain, feed intake, and feed efficiency did not improve from 28 to 42 days of age. (18) studied for two weeks the impact of high amounts of green tea powder (1, 2 and 4 percent) on broiler growth performance. Body weight, feed consumption, and FCR differences were also insignificant. In contrast to the previous investigations, (19) found that at the 0.5 percent level of green tea, broilers gained considerably more weight (1210.61 g/bird) during the finishing period (1210.61 g/bird) than at the 1 percent level (1033.36 g/bird). (20) added a liquid hydroalcoholic extract of fresh green tea to broiler diets (0.1 g/kg or 0.2 g/kg). (21) reported that green tea diet levels increased feed intake and carcass weights linearly. The hematological values were within normal limits for healthy quail. The liver weights of the green tea 10g/kg group were higher than those of the control group. Green tea powder supplementation improves total feed intake and carcass performance in Jumbo quail, but not feed efficiency, hematological, or meat quality indices (21).

Table 1. Effect of different levels of green tea powder on local quail weight traits

Traits	Treatments (Mean ± SE)					
	Control	High lipids	Tea 1%	High lipids + Tea 1%	Tea 2%	High lipids + Tea 2%
Initial Quail weight(g)	192.62 ± 4.8 a	185.76 ± 5.8 a	196.50 ± 5.14 a	201.08 ± 4.6 a	186.92 ± 4.8 a	197.01 ± 5.1 a
Medium quail weight (g)	228.77 ± 6.4 abc	231.77 ± 5.2 abc	234.80 ± 6.08 ab	240.72 ± 5.4 a*	215.46 ± 5.1 c	220.58 ± 6.7 bc
Final Quail weight (g)	237.61 ± 6.8 a	234.77 ± 4.2 a	238.40 ± 5.2 a	238.09 ± 4.8 a	224.30 ± 3.4 a	225.25 ± 5.6 a
Daily gain (g/bird)	0.489 ± 0.05 a	0.532 ± 0.06 a*	0.409 ± 0.02 ab	0.411 ± 0.01 ab	0.421 ± 0.02 ab	0.328 ± 0.03 b
Hot carcass weight(g/bird)	128.11 ± 4.75 ab	128.34 ± 4.01 ab	138.58 ± 5.51 a*	135.11 ± 3.49 ab	127.6 ± 3.45 ab	124.58 ± 3.55 b
Cold carcass weight(g/bird)	127.5 ± 4.5 ab	127.5 ± 3.75 ab	137.76 ± 5.65 a*	134.71 ± 3.46 ab	127 ± 3.43 ab	123.33 ± 3.14 b
Dressed %	53.92 ± 0.48 c	54.67 ± 0.82 bc	58.13 ± 0.83 a**	56.74 ± 0.54 b	56.89 ± 0.35 b	55.31 ± 0.56 b

The same letters in the same row indicate no significant differences. * Significant at (P≤0.05).

Egg production

Table 2 shows a significant superiority of the control-treated quail birds in the number of eggs produced, the amount of feed intake and the HDP, which amounted to 83.07 eggs, 2936.4 g and 90.38%, respectively. However, birds fed on 1% of green tea powder gave the highest average egg weight of 11.67 g/egg. While the highest egg mass was in favor of the treated birds fed on 2% of tea powder with 3% of lipids (Table, 2). The effect of green tea returns to the biological role of flavonoids present in green tea in terms of antimicrobial, antifungal, antiseptic and anti-inflammatory activities or the role of green tea as an antioxidant (22). Research results differed regarding the effect of green tea powder on egg production in birds, with (2) noting that the use of green tea powder at 0.3% decreased the average egg weight. In contrast to these findings, (5) found that adding up to 2% green tea powder to layer feed had no negative impact on egg production rate or egg weight when compared to the control. According to (23), there was no significant difference in egg weight, rate of egg production, or egg mass between the control group and the laying hens fed diets supplemented with 1% green tea, with 5 and 10% yielding the lowest production. (24) found that adding 0.6 percent green tea to the layer diet had no influence on the egg production rate of chickens over the course of a long-term feeding trial. (25) recently discovered that supplementing layer diets with 0.5 percent green tea extract and 1.5 percent green tea powder had no significant

effects on feed intake, egg production and egg weight.We notice from Table 3 a significant superiority of birds fed on a diet added to it 1% of green tea powder in most of the internal characteristics of the egg, as the highest egg weight reached 12.38 g/egg, egg albumin weight was 6.16 g/egg, the highest yolk height was 8.97 mm and the highest yolk color was 4.78. While the highest eggshell weight was 2.21 g/egg and eggshell thickness was 0.202 for birds fed on 2% green tea powder with 3% lipids.The results of a number of researches indicate that green tea supplementation in diets increases the quality of eggs. (2) used 0.3 percent green tea powder in layers feed showed the improved of Haugh unit, and albumen percentage, while yolk percentage was lower in the green tea powder group. (5) discovered that eggshell thickness was considerably reduced in the layer group fed green tea powder, regardless of dietary amounts (0.5, 1, 1.5 and 2.0 percent). When compared to the control diet, the yolk color score (yellowness of egg yolk) was higher in the layers given the 2% green tea diet.

Table 2. Effect of different levels of green tea powder on egg production traits in local quail

Traits	Treatments (Mean ± SE)					
	Control	High lipids	Tea 1%	High lipids + Tea 1%	Tea 2%	High lipids + Tea 2%
Egg number/week	83.07 ± 1.37 a*	81.07 ± 0.66 a	60.13 ± 1.02 c	69.66 ± 1.14 b	80.13 ± 1.11 a	81.66 ± 0.80 a
Egg weight (g)	11.12 ± 0.12 bc	11.14 ± 0.09 bc	11.67 ± 0.11 a*	10.82 ± 0.08 c	10.85 ± 0.10 c	11.48 ± 0.13 ab
Feed intake/Week(g)	2936.4 ± 21.6 a**	2649.33 ± 84.4 b	2217.73 ± 39.9 c	2259.93 ± 82.2 c	2596 ± 46.4 b	2680.80 ± 87.2 b
Feed conception	3.219 ± 0.09 a	2.937 ± 0.08 a	3.915 ± 0.09 a	3.013 ± 0.11 a	3.052 ± 0.14 a	2.906 ± 0.13 a
HDP (%)	90.38 ± 1.21 a*	89.08 ± 0.73 a	78.33 ± 1.21 b	88.67 ± 1.54 a	87.22 ± 1.58 a	88.92 ± 0.94 a
Egg mass (g)	9.98 ± 0.22 ab	9.94 ± 0.13 ab	9.19 ± 0.34 b	9.42 ± 0.24 ab	9.49 ± 0.22 ab	10.20 ± 0.17 a*

The different letters in the same row indicate significant differences. * Significant at (P≤0.05). ** Significant at (P≤0.01).

Table 3. Effect of different levels of green tea powder on egg traits in local quail

Traits	Treatments (Mean ± SE)					
	Control	High lipids	Tea 1%	High lipids + Tea 1%	Tea 2%	High lipids + Tea 2%
Egg weight (g)	11.58 ± 0.22 ab	11.68 ± 0.26 ab	12.38 ± 0.31 a*	11.27 ± 0.37 b	11.09 ± 0.24 b	11.71 ± 0.30 ab
Yolk and Albumin weight (g)	9.39 ± 0.18 ab	9.64 ± 0.25 ab	10.27 ± 0.36 a*	9.55 ± 0.31 ab	9.23 ± 0.25 b	9.50 ± 0.42 ab
Albumin weight (g)	5.48 ± 0.10 b	5.82 ± 0.16 ab	6.16 ± 0.21 a*	5.75 ± 0.21 ab	5.44 ± 0.20 b	5.53 ± 0.21 ab
Yolk weight (g)	3.91 ± 0.11 a	3.82 ± 0.12 a	4.10 ± 0.19 a	3.79 ± 0.18 a	3.79 ± 0.12 a	3.97 ± 0.21 a
Shell weight (g)	2.19 ± 0.12 a	2.04 ± 0.10 ab	2.11 ± 0.09 a	1.72 ± 0.08 b	1.86 ± 0.10 ab	2.21 ± 0.09 a*
Hardness (g/cm2)	552.94 ± 42.06 a	588.55 ± 32.2 a	536.72 ± 27.6 a	518.78 ± 27.4 a	555.78 ± 27.1 a	553.94 ± 26.9 a
Yolk high (mm)	8.53 ± 0.22 b	8.97 ± 0.25 ab	9.33 ± 0.33 a*	8.73 ± 0.15 ab	8.93 ± 0.19 ab	8.77 ± 0.23 ab
Albumin high (mm)	1.48 ± 0.16 a	1.54 ± 0.12 a	1.84 ± 0.14 a	1.62 ± 0.15 a	1.44 ± 0.14 a	1.51 ± 0.16 a
Haugh unit	68.49 ± 1.46 a	69.38 ± 1.21 a	71.28 ± 1.24 a	70.27 ± 1.32 a	68.45 ± 1.22 a	1.51 ± 0.16 a
Yolk color	4.33 ± 0.09 c	4.28 ± 0.11 c	4.78 ± 0.12 a**	4.67 ± 0.13 ab	4.44 ± 0.12 bc	4.72 ± 0.11 ab
Shell thickness (mm)	0.199 ± 0.0003 ab	0.200 ± 0.0004 ab	0.195 ± 0.0004 ab	0.186 ± 0.0004 b	0.192 ± 0.0005 ab	0.202 ± 0.0005 a*

The same letters in the same row indicate no significant differences. * Significant at (P≤0.05). ** Significant at (P≤0.01).

(7) found that eggshell thickness and form index were considerably reduced in layers fed 1 or 2% green tea diets compared to controls. However, there were no significant variations in eggshell thickness between layers fed green tea inclusion diets and those fed a control diet. Green tea and control treatments had the same albumen weight, yolk weight, and Haugh unit of the eggs. (26) and (24), on the other hand, found that including green tea in the layer diet

enhanced the Haugh unit score of the eggs. They found that green tea feeding resulted in increased albumen height and physical stability of egg albumen, as well as an improvement in the Haugh unit score. (27) found that albumen was thicker in groups given green tea powder, and attributed this to the likely transfer of polyphenols from the green tea powder into β-ovomucin. By establishing interactions with proteins and polysaccharides, the β-ovomucin boosts albumen durability. on the other hand, (23), found no significant differences in the yolk color fan score or eggshell strength for four treatments (green tea powder added (0, 1, 5 and 10 percent of the hen diets). However, they discovered that as green tea powder consumption increased, eggshell strength, thickness, and Haugh unit values dropped, particularly in the 10% group. More than 1percent green tea leaves (3 and 5 percent) according to (28), were required to significantly increase both exterior and internal egg quality measures.

Biochemical traits

The results of the study shown in Table (4) showed a significant (P≤0.05) improvement in the blood lipid profile in favor of quail birds fed on rations containing green tea powder, as the lowest value for total cholesterol (156.2), triglycerides (1705), LDL (13.94), VLDL (336.1) and the highest values of HDL (19.32) were in the treatments of birds fed different levels of green tea powder. Similar results were reported by (22) discovered that adding 0.25, 0.5, and 0.75 percent powdered green tea blossoms to growing Japanese quail diets reduced blood lipid fractions and boosted high-density lipoprotein (HDL). (4), adding green tea to bird's diets reduced blood low-density lipoprotein (LDL) cholesterol content compared to a control group, albeit there were no significant changes across treatments. According to (28), adding 3 and 5% green tea leaves to hens' diets significantly reduced total blood plasma cholesterol and total lipids. In comparison to the control, 1.5 L/100 kg green tea extract was required to raise the favorable blood plasma HDL. In comparison to the control, the 1.5 L/100 kg meal of hot water green tea extract resulted in a 4.66 percent reduction in blood plasma cholesterol and a 7.14 percent increase in blood plasma HDL. Green tea's beneficial effect on blood lipid profiles may be attributed to caffeine, and the catechin component of green tea may have an inhibitory effect on fat absorption in the intestine (29). The conversion of cholesterol to bile acids takes place solely in the liver and is the primary route for cholesterol elimination from the body. This could also account for the drop in cholesterol levels. On the other hand, (30), found that adding 5g/kg of green tea to broiler feed had no influence on the chemical composition of plasma total lipids, cholesterol, plasma aspartate aminotransferase, and alanine aminotransferase activities. (31) and (32) also showed that the addition of green tea powder to quail diet did have a significant effect on decreasing the blood serum cholesterol concentrations. The results also indicate that there are significant (P≤0.01) differences in the average blood urea and nitrogen, with the highest value being 6.6 and 3.376, respectively, for birds fed 3% of lipids, while the control group recorded the highest significant(P≤0.05) value in ALT, Alkaline and bilirubin in quail blood (Table, 4). Table (5) shows that quail birds in the control group have a substantial superiority (P≤0.05) in estradiol hormone concentration of 75.13 pg/ml, which is reflected in the percentage of egg production in this group of 90.38 percent (Table 2). Estradiol, which serves a variety of roles in the female body, could be to blame for this result. Its major function is to mature the reproductive system and then sustain it. The maturation and release of the egg is caused by rising estrogen levels. The results of table (5) also indicate a significant superiority (P≤0.05) of quail fed on 3% of lipids in each of the hormones leptin and ghrelin, which amounted to 1.493 ng/ml and 66.08 pg/ml, respectively, this result was reflected significantly and negatively in the high levels of harmful fats, low sugar, high nitrogen and blood urea (Table 4). On the contrary, the quail birds fed on 1% of green tea powder recorded the lowest levels of the hormones leptin and ghrelin, which arrived to 0.334 ng/ml and 59.64 pg/ml, respectively, and this was positively and significantly reflected on the lipid profile, sugar and blood urea levels of the birds of this group (Table 4). Since the hormone thyroxine

(T4) is responsible for the metabolism, mood and body temperature in birds, and the significant increase in the level of this hormone in quail birds fed 1% of green tea powder amounting to 106.23 ng/ml, we note from the results of the statistical analysis a significant superiority of birds of this group in the characteristics of productivity and reproduction, especially in the carcass weight or the dressing ratio (Table 1), the egg weight and the most internal egg characteristics (Table 2 and 3). The results also indicate a significant superiority (P≤0.05) of birds fed 2% and 1% of green tea powder in the levels of LH hormone, but this superiority did not result in a superiority in the percentage of egg production due to the lower levels of the FSH hormone responsible for the formation of follicles in these two groups compared to the birds of the control group (Table 5). Significant differences (P≤0.01) were found in the level of growth hormone between groups, as the highest value was in the group of quail birds fed on 2% of green tea powder with 3% of the lipids, and the group of birds fed on 3% of the lipids, which amounted to 1692.42 and 1622.13 pg/ml, respectively. It significantly affected the daily weight gain in the group of birds fed on 3% of lipids, while it significantly and negatively affected the rate of daily weight gain of quail birds fed on 2% of green tea powder with 3% of lipids (Table 1). Also, the HDP was in both groups, they are close and not significant, with the highest HDP for the control group (Table 2).

Table 4. Effect of different levels of green tea powder on blood biochemical traits in local quail

Traits	Treatments (Mean ± SE)					
	Control	High lipids	Tea 1%	High lipids + Tea 1%	Tea 2%	High lipids + Tea 2%
Cholesterol mg/dL	264.6 ± 31.13 b	347 ± 68.3 a*	190.2 ± 21.66 c	186.40 ± 17.1 c	156.2 ± 71.01 c	193.40 ± 16.67 bc
Triglycerides mg/dL	2855.6 ± 51.2 b	5090.6 ± 101.6 a***	1973.2 ± 42.66 c	1743.8 ± 39.45 c	1705 ± 38.89 c	2414.40 ± 52.3 bc
HDL mg/dL	3.1 ± 0.07 c	3.1 ± 0.1 c	9.36 ± 0.96 bc	19.32 ± 0.99 a**	10.98 ± 0.81 b	13.24 ± 0.72 ab
LDL mg/dL	26.45 ± 1.68 a	30.76 ± 2.4 a***	17.96 ± 1.02 b	13.36 ± 0.66 b	13.94 ± 0.68 b	16.24 ± 0.99 b
VLDL mg/dL	489.92 ± 3.2 b	1018.12 ± 8.3 a***	394.64 ± 2.8 b	348.76 ± 2.09 b	336.1 ± 1.89 b	482.88 ± 2.08 b
Blood Sugar mg/dL	338.40 ± 17.85 b	308.40 ± 9.21 c	347.8 ± 15.33 ab	322.20 ± 6.1 bc	371.60 ± 15.30 a**	346.40 ± 9.1 ab
Blood Urea mg/dL	4.5 ± 1.07 b	6.6 ± 1.26 a***	3.6 ± 0.17 bc	4 ± 0.54 bc	3.2 ± 0.40 c	3.2 ± 0.26 c
Creatinine mg/dL	0.2 ± 0.001 a	0.2 ± 0.001 a	0.2 ± 0.001 a	0.2 ± 0.001 a	0.2 ± 0.001 a	0.2 ± 0.001 a
Blood Urea Nitrogen mg/dL	2.82 ± 0.98 a	3.376 ± 0.72 a**	1.486 ± 0.07 b	1.650 ± 0.22 b	1.318 ± 0.16 b	1.320 ± 0.10 b
Uric Acid mg/dL	8.26 ± 0.54 a	7.02 ± 0.43 a	7.20 ± 0.56 a	6.42 ± 0.33 a	7.66 ± 0.46 a	7.40 ± 0.41 a
SGOT(AST) IU/L	198.6 ± 5.14 a	236 ± 6.21 a	227.6 ± 5.84 a	220 ± 4.76 a	197.4 ± 5.3 a	200.2 ± 5.4 a
SGPT(ALT) IU/L	3.4 ± 0.98 a*	2.8 ± 0.69 ab	1 ± 0.10 b	1.4 ± 0.16 b	1.6 ± 0.17 ab	1.4 ± 0.15 b
Alkaline Phosphatase IU/L	701.34 ± 36.63 a*	560.86 ± 23.7 ab	308.3 ± 31.3 b	360.5 ± 25.3 b	546.42 ± 21.6 ab	446.66 ± 32.5 ab
Bilirubin mg/dL	0.028 ± 0.004 a*	0.01 ± 0.001 ab	0.002 ±0.0001 b	0.002 ± 0.0001 ab	0 ± 0 b	0 ± 0 b

The same letters in the same row indicate no significant differences. * Significant at (P≤0.05). ** Significant at (P≤0.01).

Table 5. Effect of different levels of green tea powder on Hormonal levels in local quail

Traits	Treatments (Mean ± SE)					
	Control	High lipids	Tea 1%	High lipids + Tea 1%	Tea 2%	High lipids + Tea 2%
Growth Hormone	1437.29 ± 17.32	1622.13 ± 3.11	1564.56 ± 15.80	1534.39 ± 11.4	1471.33 ± 18.60	1692.42 ± 17.60
pg/ml	c	ab	bc	bc	c	a**
Ghrelin	63.212 ± 1.33	66.08 ± 2.22	59.64 ± 1.20	65.04 ± 0.61	64.48 ± 1.06	66.06 ± 0.95
pg/ml	ab	a*	b	a	a	a
Leptin	0.7132 ± 0.35	1.493 ± 0.29	0.334 ± 0.05	0.464 ± 0.07	0.401 ± 0.05	0.478 ± 0.08
ng/ml	b	a*	b	b	b	b
Thyroxine (T4)	79.30 ± 1.31	87.11 ± 1.86	106.23 ± 0.81	103.10 ± 1.21	106.14 ± 0.61	94.72 ± 1.60
ng/ml	c	bc	a**	a	a	ab
Estradiol	75.13 ± 1.95	65.60 ± 1.86	69.70 ± 1.21	66.73 ± 0.62	72.22 ± 1.06	66.17 ± 1.61
pg/ml	a*	c	abc	bc	ab	bc
Triiodothyronine (T3)	2.964 ± 0.005	2.970 ± 0.001	2.966 ± 0.001	2.968 ±0.001	2.966 ± 0.001	2.968 ± 0.001
ng/ml	a	a	a	a	a	a
FSH	237.574 ± 7.8	289.10 ± 8.1	163.45 ± 6.02	145.36 ± 5.91	210.64 ± 6.90	213.10 ± 7.33
pg/ml	ab	a*	bc	c	b	b
LH	1638.48 ± 96.4	1667 ± 98.91	1574.70 ± 92.03	1815.80 ± 26.80	1797 ± 31.80	1890.8 ± 27.8
pg/ml	ab	ab	b	ab	ab	a*

The same letters in the same row indicate no significant differences. * Significant at (P≤0.05). ** Significant at (P≤0.01).

CONCLUSIONS

Based on the above results in this study, the Supplementation of green tea to the diets of birds can improve the productive performance and reduce the cholesterol content in the serum and implying its potential effect on internal egg quality characterization. This information will be helpful for poultry industry and nutritionists. More detailed studies are still needed to elucidate the effect of green tea powder on poultry production and reproductive traits under various circumstances.

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