

## **THE EFFECT OF GENISTEIN ON SOME PRODUCTIVE AND BIOCHEMICAL BLOOD TRAITS OF QUAIL ( *Coturnix coturnix japonica* )**

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### **ABSTRACT**

This study was conducted at commercial poultry farm in Aboalkassib from 9/3/2013 to 9/5/2013. A total of 60 day old quail chicks were randomly distributed to four groups , 15 birds for each treatments. Treatments were (1): control group , (2) : 100 ml genistein per 1 litter of drinking water, (3): 100 ml genistein plus 10 ml vitamin E per 1 litter of drinking water , and (4): 150 ml genistein plus 10 ml vitamin E per 1 litter of drinking water . T3 caused significantly ( $P<0.05$ ) increase in PCV and Hb during two periods of the experiment, and in the cholesterol concentration during (0-30) days of age . Whereas, T3 and T4 caused significantly ( $P<0.05$ ) increase in the cholesterol during (0-60) days of age . Glucose also increased significantly ( $P<0.05$ ) in T4 during (0-30) days of age and in T2 during (0-60) days of the of the experiment. T2 resulted in increase in estrogen concentration significantly ( $P<0.05$ ) during 0-30 days of the experiment.

### **INTRODUCTION**

The isoflavone genistein as a phytoestrogen that found in soy and soy products in different concentration ( 1,12,19) , has been given a great attention by researchers in the last seven years in the human and animal studies , because of its ability in treatment of some disease including diabetes , osteoporosis , arthritis and various types of cancers ( 13) and its role in the prevention of obesity (2, 16) as a result of its effects on glucose and lipid metabolism (10, 25). Genistien has antioxidant properties (9, 20, 28) which might be attributed to its influence to decrease the production of free radicals in plasma , liver , brain and kidney of male rabbits ( 30). Diets containing

genistein obviously enhances the activities of antioxidant enzymes in mice ( 3, 28) . In poultry studies , dietary of genistein improved weight gain and meat quality of male broiler ( 8 ) which are the main aim in broiler production .

On the other hand , vitamin E as antioxidant that involves in the metabolic processes such as preventing oxidation of unsaturated fatty acids and lipids , it can inhibits formation of toxic peroxides of unsaturated fatty acids (7, 26 ) . In mice ,(27) found a protective of vitamin E role against oxidative stress by enhancing the level of endogenous antioxidants and inducing heat shock protein gene expression . For all those previous observations , this study was conducted to investigate the influence of genistein on the performance of Japanese quail birds . In addition , vitamin E was used in the same level as complementary antioxidant to strength the role of genistein in some of the experimental treatments

## **MATERIAL AND METHODS**

This study was conducted at commercial poultry farm in Aboalkassib from 9/3/2013 to 9/5/2013 to investigate the influence of adding genistein into drinking water on some performance and physiological parameters of quail birds( *Coturnix coturnix japonica* ) .A total of 60 day- old quail chicks were randomly distributed to fourgroups , 15 birds for each group as follow : group (1) : the birds were drinking water only , group (2): the birds treated 100 ml genistein per 1 liter of drinking water , group (3) :the birds treated 100 ml genistein plus 10 ml vitamin E per 1 liter of drinking water and group (4) :the birds were treated 150 ml genistein plus 10 ml vitamin E per 1 liter of drinking water.Birds were housed in pens at dimensions of (60x60) cm , providing (240) cm<sup>2</sup> per bird . Birds fed diet containing 20% crud protein and 2800 kcal /kg of metabolic energy during 0-30 days of age and 18% crud protein and 2900 kcal/kg ofmetabolic energy during 30-60 days of experiment . Feed and water provided ad libitum for birds daily. Body weights recorded after 30 and 60 days of age for all experimental birds. After 30 and 60 days of experiment , two randomly birds from each treatment were weighted by scale . Blood samples also were taken from slaughter birds to measure hemoglobin concentration (Hb) according to method of (22) . Packed cell volume (PCV) accounted according to ( 16). Cholesterol , total protein and urea concentrations were made by use of measurement system of France Biomerieux company . Measurement systems designed by

Biochemica company were used to measure albumin concentration . Glucose concentration were measured by England Plamatec company. Concentration of estrogen and testosterone hormones were measured by use measurement systems of American MonobindInc company.

Data of experiment were analysed by using of SPSS (24) statistical program.

## RESULTS

Body , carcass , thigh and breast weights are presented in table (1). No significant ( $P<0.05$ ) differences were observed among treatments during the two periods of genistein supplementation in body and carcass weights and in thigh weight during (0-30) days of experiment period. T2 showed heavier thigh weight significantly ( $P<0.05$ ) compared to T1 and T3 during the period from 0-60 days of the age . T4 showed less breast weight significantly ( $P<0.05$ ) in comparison to other treatments during (0-30) days of the experiment . Whereas, there were no significant ( $P<0.05$ ) differences observed among treatments during (0-60) days of experiment .

Table (1): Effect of genestein and vitamin E on body weight and cuts weight in Quail (Means±SE)

Treatments	Period (days)	Body weight (gm.)	Carcass weight (gm.)	Thigh weight (gm.)	Breast weight (gm.)	Wing weight (gm.)
T1	0 - 30	200.3 20.1±	134.6 10.9±	32.0 1.37±	71.6 ab 3.33±	12.6 1.00±
T2	0 - 30	222.3 10.9±	140.0 11.8±	34.0 2.05±	73.0 a 3.11±	11.3 0.91±
T3	0 - 30	206.0 11.6±	140.3 15.1±	34.0 1.99±	76.3 a 2.05±	12.0 0.81±
T4	0 - 30	205.0 16.7±	134.3 13.3±	33.3 1.15±	67.0 b 1.99±	15.3 1.51±
means		208.4 20.9±	137.3 12.6±	33.3 1.08±	72.0 3.21±	12.8 1.11±
T1	0 - 60	210.6 12.2±	127.3 9.90±	29.3 b 2.01±	67.3 2.88±	12.6 1.11±
T2	0 - 60	221.6 14.5±	148.3 10.4±	38.0 a 1.99±	75.0 2.11±	14.0 1.16±
T3	0 - 60	206.6 15.5±	127.6 11.1±	30.0 b 1.61±	68.6 3.03±	12.6 0.99±
T4	0 - 60	218.0 18.1±	137.0 10.6±	34.6 ab 1.08±	71.6 3.13±	13.3 0.86±
means		214.2 17.6±	135.0 14.4±	33.0 1.11±	70.6 2.90±	13.1 1.13±

Different letters within column means significant difference ( $P<0.05$ ) between treatments and period. T1: control , T2: 100 ml genestien, T3 : 100 ml genestien + 10 Vit.E , T4: 150 ml genestein + 10 ml Vit.E

The results of PCV and Hb are presented in table (2) . Birds of T3 showed a significant ( $P<0.05$ ) increase in PCV and Hb during two periods of the experiment compared to other treatments .

Table (2): Effect of genestein and vitamin E on some blood parameters in Quail (Means±SE)

Treatments	Period (days)	PCV%	Hb ( gm/100ml)
T1	0 - 30	35.6 b 2.11±	8.80 b 0.06±
T2	0 - 30	34.2 b 2.61±	8.70 b 0.08±
T3	0 - 30	44.2 a 2.39±	11.2 a 0.10±
T4	0 - 30	17.0 c 1.00±	6.1 c 0.09±
means		32.9 1.99±	8.7 0.06±
T1	0 - 60	36.0 bc 2.81±	11.9 b 0.03±
T2	0 - 60	30.9 c 2.61±	10.3 b 0.04±
T3	0 - 60	45.0 a 3.01±	14.9 a 0.05±
T4	0 - 60	39.4 ab 2.41±	13.1 ab 0.06±
means		37.8 2.00±	12.5 0.08±

Different letters within column means significant difference ( $P<0.05$ ) between treatments and period. T1: control , T2: 100 ml genestien, T3 : 100 ml genestien + 10 Vit.E , T4: 150 ml genestein + 10 ml Vit.E .

There was a significant ( $P<0.05$ ) increase in cholesterol concentration of birds (table 3) , thattreated with T3 during (0-30) days period than those of other groups whereas the cholesterol increased significantly ( $P<0.05$ ) in T3 and T4 during (0-60) days of the experiment in comparison with other treatments (table 3) .There was asignificant ( $P<0.05$ ) decrease in cholesterol concentration after 60 days of genistein supplementation (0-60) days . Total protein concentration of birds supplemented with T3 increased significant ( $P<0.05$ ) in comparison with other treatments (table 3).

Table 3 revealed a significant ( $P<0.05$ ) increase in glucose of birds that were treated with T4 during the period (0-30) days of age and another increase were showed in glucose of birds treated with T2 during (0-60) days of the experiment .

Table (3): Effect of genestein and vitamin E on blood biochemical parameters in Quail (Means±SE)

Treatments	Period (days)	Cholesterol gm/100ml	Total protein gm/100ml	Albumin gm/100ml	Glucose mg/100ml	Urea gm/1000ml
T1	0-30	113.4 a ±10.2	2.64 b ±0.16	1.25 ±0.04	27.7 c ±1.11	0.146 ±0.001
T2	0-30	68.0 b ±7.1	3.23 b ±0.14	0.96 ±0.01	60.2 b ±3.31	0.130 ±0.002
T3	0-30	118.0 a ±11.3	5.14 a ±0.11	1.74 ±0.03	81.6 b ±3.95	0.145 ±0.001
T4	0-30	60.8 b ±9.90	3.20 b ±0.12	1.23 ±0.02	130.0 a ±6.61	0.140 ±0.003
means		92.7 A ±8.81	3.51 ±0.10	1.25 ±0.01	74.3 ±4.01	0.140 ±0.001
T1	0-60	44.67 b ±6.11	2.94 ±0.11	2.13 ±0.02	47.7 c ±0.02	0.126 ±0.004
T2	0-60	41.80 b ±2.31	3.89 ±0.12	2.17 ±0.03	147.5 a ±4.50	0.140 ±0.005
T3	0-60	63.11 a ±3.33	2.35 ±0.12	1.71 ±0.01	86.0 b ±2.12	0.136 ±0.003
T4	0-60	57.40 a ±2.21	2.70 ±0.02	1.34 ±0.05	49.5 c ±1.86	0.133 ±0.003
means		51.76 B ±2.11	3.07 ±0.11	1.77 ±0.02	82.7 ±2.23	0.134 ±0.002

Different small and big letters within column means significant difference (P<0.05) between treatments and periods respectively. T1: control , T2: 100 ml genestein, T3 : 100 ml genestein + 10 Vit.E , T4: 150 ml genestein + 10 ml Vit.E

Table 4 revealed a significant (P<0.05) increase inestrogen concentration of birds supplemented with T2 during 0-30 days of the experiment , also , increased in birds treated with T3 and T4 during (0-60) days of experiment . Concentration of testosterone hormone decreased significantly (P<0.05) in birds T4 comparison with T1 and T3 during 0-60 days of the experiment (table 4) .

Table (4): Effect of genestein and vitamin E on steroid hormones in serum for different period in Quail (Means±SE)

treatments	Period (days)	Estrogen (ng/ml)	testosterone (ng/ml)
T1	0-30	100.8 ± 10.11 b	1.68 ± 0.01
T2	0-30	123.0 ± 12.00 a	1.40 ± 0.02
T3	0-30	105.2 ± 9.90 b	1.42 ± 0.06
T4	0-30	117.4 ± 11.1 ab	1.50 ± 0.03
means		92.7 ± 8.81 A	1.49 ± 0.04
T1	0-60	52.14 ± 2.42 b	1.70 ± 0.03 a
T2	0-60	50.20 ± 3.01 b	1.40 ± 0.01 ab
T3	0-60	74.16 ± 4.41 a	1.72 ± 0.02 a
T4	0-60	72.00 ± 2.77 a	1.13 ± 0.03 b
means		51.7 ± 2.11 B	1.51 ± 0.04

Different letters within column means significant difference (P<0.05) between treatments and period. T1: control , T2: 100 ml genestein, T3 : 100 ml genestein + 10 Vit.E , T4: 150 ml genestein + 10 ml Vit.E .

## DISCUSSION

The effect of supplemented genistein by drinking water on body parameters as noticed in our results are variable when (8) found increase in body weight of male broiler when they were fed diet containing 10 or 20 mg of genistein /kg of the diet . Whereas,(29) reported that isoflavones supplemented into the diet at 1 and 5 % did not influence the growth performance of the Japanese quail . These results is possibly related to the period of genistein addition .(4) reported that isoflavones may act as estrogen agonist depending on dose , duration of use , individual metabolism .

The reason of the increase in PCV and Hb during two period , may be due to the ability of genistein to enter cell membrane of red blood cells and also may involve in the biological activity of hemoglobin synthesis by formation bonds which bind ferric with haem molecule ( 17).

(23) also pointed out that phytoestrogen can binding with cholesterol in the intestinal and then it absorbed into body tissues , which may cause increase in cholesterol concentration in the blood serum .Genistein may also has the role in carbohydrate metabolism by increase acetate release which is the main responsible factor in the cholesterol synthesis (18) . Our results agreed with the results of (14) .

The result of decrease cholesterol concentration in this study after 60 days of treatment may due to the ability of genistein to depress high cholesterol levels in the case of pronolaged periods of use (21) because of the utilization from the cholesterol in the process of estrogen hormone synthesis in the birds with advantage of ages ( 25) . Similar results were also observed by (13) .

The reason of increase of glucose in T4 during (0-30) days of treatment , may relate to the truth that genistein has substantial role in the process of glycogen phosphorylation happening in the muscles , as well as , it causes increase of glycogen analytic in the liver and releasing it into blood serum ( 25). (5) pointed out that genistein may activates  $\beta$ -cells of pancreases to produce insulin and increase glycogen analytic to glucose . Our results agreed with the results of (11) in mice.

Isoestrogen structure of phytoestrogen also may help in the process of binding genistein to estrogen receptors in the uterus , ovaries and testes instead of estrogen

and as a result , estrogen concentration increase in the serum ( 25) , which may be the cause of increase estrogen concentration in birds that supplemented with T2 during 0-30 days of experiment. Genistein also may inhibit secretion of testosterone hormone from leydig cells or it may has role in the mechanism by which secretion of testosterone stop (15) .

## CONCLUSION

From our results , we concluded that use of treatment , almost , improved breast weight and thigh weights but decreased cholesterol levels. There was fluctuation respecting the influence of treatments on estrogen and testosterone hormones levels .

تأثير الجنسيتين في بعض الصفات التناسلية والكيموحيوية لدم طيور السمان

(*Coturnixcoturnix japonica* )

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### الخلاصة

اجريت التجربة في حقل دواجن اهلي في ابي الخصيب للفترة بين 2013/3/9 ولغاية 2013/5/9 . استخدم 60 فرخا" من افراخ طائر السمان التي وزعت عشوائيا" الى اربعة معاملات باستخدام الجنسيتين وفيتامين E ، وبواقع 15 فرخا" لكل معاملة . المعاملات هي ( 1): السيطرة ( المقارنة) ، ( 2) : استخدام 100 مل جنسيتين لكل 1 لتر من ماء الشرب ، (3) : استخدام 100 مل جنسيتين مضاف اليه 10 مل من فيتامين E لكل لتر من ماء الشرب ، (4) استخدام 150 مل جنسيتين مضاف اليه 10 مل من فيتامين E لكل لتر من ماء الشرب. ادت المعاملة الثالثة ( T3 ) الى زيادة معنوية ( $P<0.05$ ) في حجم كريات الدم المرصوصة والهيموجلوبين خلال فترتي الدراسة ، وكذلك زيادة في تركيز الكولسترول خلال فترة ( 0-30 ) يوم من التجربة . بينما سببت المعاملتان T3 و T4 زيادة معنوية ( $P<0.05$ ) في تركيز الكولسترول خلال الفترة (0-60) يوما" من التجربة . ازداد مستوى الكلوكوز معنويا" ( $P<0.05$ ) عند استخدام المعاملة T4 خلال الفترة ( 0-30) يوما" من التجربة وفي المعاملة T2 خلال الفترة (0-60) يوما" من التجربة . ادت المعاملة T2 الى زيادة معنوية ( $P<0.05$ ) في تركيز الاستروجين خلال الفترة (0-30) يوما" من التجربة .

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