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EFFECT OF DIETARY GINSENG SUPPLEMENTATION ON PRODUCTIVE AND REPRODUCTIVE TRAITS FOR SINAI LAYER STRAIN

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ABSTRACT:

A total number of 150 Sinai laying hens and 15 cocks 24 weeks of age were randomly distributed into three treatments, each containing 50 hens and five cocks in five replicates of 10 hens and one cock each. Ginseng was dietary supplemented with levels of 0, 150 mg and 300 mg/Kg of the diet, during the experimental period (24-48 weeks of age).

The overall results showed that there were no significant differences in body weight, weight gain, feed intake, egg shape index and yolk index values while, there were significant differences in egg production, egg mass, feed conversion, albumin%, shell% and Haugh unit values due to feeding laying hens on diets supplemented with ginseng as compared with the control diet, during the total experimental period (24-48 weeks of age). Also, there were an improvement in egg weight and shell thickness values due to feeding laying hens on diets supplemented with ginseng at early laying stage (24-32 weeks of age). While, at the periods 33-40, 41-48 and 24-48 weeks of age, data showed that there were no significant differences in the average values of either egg weight or shell thickness as compared with the control diet.

The results showed that there were no significant differences in blood profiles of total protein, albumin, globulin, LDL, glucose, AST, ALT phosphorus, T_3 and testosterone values due to dietary supplementation with ginseng. Whereas there were significant differences in cholesterol and calcium values with increasing dietary ginseng supplementation level. Data showed that there were no significant differences in gizzard, liver and heart wt%. (relative to pre-slaughter weight), while, there were significant differences in carcass, giblets, dressing% (relative to pre-slaughter weight) as a result of dietary supplementation with ginseng. Semen quality was improved by supplementing ginseng to the layer diets as compared with the control diet also; fertility and hatchability percentages were significantly increased. Results showed an improvement in average values of net

revenue, economical efficiency due to feeding laying hens on diets supplemented with ginseng.

***In conclusion**, results showed that supplementation of 300mg ginseng in Sinai laying hens diets improved laying hen performance; egg quality, some blood profiles, carcass characteristics semen characteristic, fertility, hatchability and economical efficiency.*

Keywords: Dietary ginseng, productive & reproductive traits, Sinai layer strain

INTRODUCTION:

Historically, ginseng is considered to be one of the most valuable medicinal and aphrodisiac herbs in East Asian countries such as China, Korea and Japan for over 5000 years. Most notable features of ginseng have been suggested to be the modulation of the immune system, cancer and diabetes (Vogler *et al.*, 1999). Dey *et al.*, (2003) also reported that ginseng may improve psychological function, immunity and conditions associated with diabetes. It is widely used in oriental medicine as a remedy for the treatment of various diseases, including anemia, diabetes mellitus, insomnia, gastritis, abnormalities in blood pressure, dyspepsia, overstrain and fatigue and so on. To date, studies from animal experiments have shown that ginseng reduced blood pressure (Kang *et al*., 1995), had a relaxing effect on vascular smooth muscle and anti-inflammatory properties as will as anti-stress effect (Peng *et al.*, 1995) and inhibited calmodulin-dependent phosphodiesterase (Sharma and Kalra, 1993).

It was previously been documented that ginseng contains various bio-active components such as saponins, antioxidants, peptides, polysaccharides, alkaloids, lignans and polyacetylenes, of which saponins (ginsenoside) are considered to be the principal bioactive ingredient (Jo *et al*., 1995; Sticher, 1998; Palazon *et al*., 2003), and are believed to have immune-stimulatory, anti-fatigue and hepato-protective physiological effects (Wu and Zhong, 1999).

Besides, it was reported that the fermentation step, apart from being an easy method to preserve raw materials for a short time prior to further processing, could give several advantages as (improved flavor, enrichment with desirable metabolites produced by the microorganisms, and enhanced safety), has been reported for other vegetable products (Buckenhüskes *et al*., 1990). Previous study also reported that feeding fermented wild-ginseng culture by-product could increase egg production and egg quality (Jang *et al*., 2007).

Therefore, the objective of the present study was to investigate the effects of ginseng meal on productive and reproductive traits, blood profiles, as well as, semen quality in Sinai local layers strain.

MATERIALS AND METHODS

***Experimental design and birds*:**

This study was conducted at El-Serw Animal Production Research Station, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Dokki, Giza, Egypt, during the year 2010.

A total number of 150 laying local Sinai strain hens and 15 cocks aged 24 weeks old and nearly similar in average body weight were divided into 3 treatments of five replicates (10 birds and one cock/each). Birds were housed in floor pens under the same managerial procedures throughout the experimental periods, which continued up to 48 weeks of age. Laying hens were fed on three experimental diets, the first one (basal diet) contained 16% CP and 2700 Kcal ME/Kg. For the second and third experimental diets, the basal diet was supplemented with 150mg and 300 mg ginseng/1Kg diet, respectively. Ingredients, calculated and chemical analysis of the basal (control) diet are shown Table 1.

Layers had free access to feed and water through out the experimental periods.

Productive measurements:

The laying hens performance, was expresses as average live body weight, average live body weight gain, feed intake, egg production rate, egg number, egg weight, egg mass and feed conversion.

Egg quality tests were carried out when birds were 32, 40 and 48 weeks of age, on forty five freshly collected eggs (3 eggs / replicate, *i.e.* / 15 eggs treatment).

Some exterior and interior parameters as well as egg components were used for quality measurement.

Blood plasma Constituents:

Blood samples for biochemical determinations were individually taken at the same time of slaughtering from 10 layers from each treatment. The blood samples were collected into heparinzed clean tubes and centrifuged immediately after collection at 4000/rpm for 5 minutes and plasma samples were transferred into clean tubes and stored in a deep freezer at approximately -20°C till the time of chemical analysis.

Chemical analysis of blood plasma were carried out calorimetrically for quantitave determination of plasma total protein (Gornal *et al.*, 1949); albumin (Doumas *et al.*, 1971); Cholesterol(Richmond, 1973); glucose (Trinder, 1969); LDL (Wieland and Seidel, 1983); ALT and AST (Reitman and Frankel, 1957); inorganic phosphorus (El-Merzabani *et al*., 1977) and calcium (Gindler and King, 1972). Using commercial kits, following the same steps as described by manufactures. Globulin concentration was obtained by subtracting the albumin

Table 1: Ingredients, calculated and chemical analysis of the control basal diet.

Ingredients	**%**
Yellow corn	63.50
Soybean meal (44%)	24.57
Wheat bran	2.00
Lime stone	7.77
Premix*	0.30
Salt	0.30
Di- calcium phosphate	1.50
DL- methionine	0.06
Total	**100.00**
Calculated analysis**	
Crude protein %	16.00
Kcal ME/Kg	2703.34
Crude fiber %	3.47
Crude fat %	2.86
Calcium%	3.32
Available phosphorus%	0.406
Lysine%	0.889
Methionine %	0.350
Methionine + Cystine %	0.620
Sodium %	0.135
Chemical analysis (%) ***	
Crude protein	15.86
Ether extract	3.01
Ash	8.31
Moisture	10.38

*** Supplied per Kg of diet:** Vit. A, 12000 IU; Vit. D_3, 2200 IU; Vit. E, 10mg; Vit. K_3 2mg; Vit. B_l. 1mg; Vit.B_2, 4mg; Vit. B_6, 1.5mg; Vit. B_{12}, 10mg, Niacin, 20 mg; Folic acid, 1mg; Pantothenic acid, 10 mg; Biotin, 50mg; Choline, 250mg; Copper, 10mg; Iron, 30mg; Cobalt, 0.1mg; Iodine, 1mg; Manganese, 55 mg; Zinc, 50 mg and Selenium, 0.1mg.

** According to Egyptian Feed Composition Tables for Animal and Poultry Feedstuffs (2001).

*** Samples were analysed according to AOAC (1995).

values from the total protein concentration from which the albumin / globulin ratio (A/G) was calculated.

Testosterone and Triiodothyronine (T_3) levels were determined using a radioimmunoassay kit (Siemens – Germany, Catalog No. $TKTT_1$). The assay is based on competition reaction with sensitivity 4 ng/dL (National Committee for Clinical Laboratory Standards, 1998) and 7 ng/dL (Tietz, 1995), respectively.

***Slaughter traits*:**

Slaughter was performed at the end of the experimental period (48 weeks of age). Ten layers from each treatment around the average live body of each

group were randomly selected. The assigned birds were deprived of feed for 16 hours prior to slaughter, thereafter they were individually weighed to the nearest gram, and slaughtered by severing the Jugular vein with a sharp knife according to the Islamic Religion. After four minutes bleeding time, each hen was dipped in a water bath for two minutes, and feathers were removed by hand and its weight recorded.

Shanks and head were separated, then the birds were eviscerated and carcass, heart, gizzard, liver and oviduct were weighted. Giblets (empty gizzard, liver and heart), dressing and carcass percentages and oviduct lengths were determined.

Semen physical characteristic:

Semen was collected individually from each cock for each replicate at 48 weeks of age using the message method squeezing the copulatory organs to obtain semen. Semen samples were examined for the following characteristics:

1- Ejaculate volume, it was determined to the nearest 0.01 ml. using 1.00 ml tuberculin syringe.
2- Mass motility score (from 1 to 5 grades) using light microscope at 4000 magnification.
3- Percentages of dead and abnormal sperms were determined after staining with iosine and nigrosine.
4- Sperm concentration was determined by using Thomes – Zeis haemocytometer.
5- Semen pH: Initial semen pH was obtained by means of comparative pH papers.

All the pervious characteristics were determined according to Kalamah *et al.* (2000).

Fertility and Hatchability Percentages:

A total of 90 eggs were collected from each treatment group, during 37-38 weeks of age to determine fertility and hatchability percentages. They were randomly divided into three equal replicates. Fertility percentage was determined in the 7^{th} days of incubation. Eggs were incubated in forced draft–type incubator (Egyptian Made) at 99.5°F temperature and 55% relative humidity in the setter and 98.6°F temperature and 65% relative humidity in Hatcher unit.

***Economical efficiency*:**

The economical efficiency of the experimental diets (the net revenue per unit feed cost) was calculated from input – out put analysis.

Statistical analyses:

All results were statistically analyzed by General Linear Model (GLM), One Way Analysis of Variance, using SAS software (SAS Institute, 2003).

Differences among means were separated using Duncan's multiple range test (Duncan, 1955).

RESULTS:

Productive performance:

The overall mean values of final body weight (BW), change of body weight (WG), feed intake (FI), feed conversion, (FC), egg number (EN), egg weight (EW), egg mass (EM) and egg production percentage (EP%) of Sinai laying hens fed on the experimental diets are presented in Table 2.

As shown in Table 2, the average initial live BW values of laying hens of different treatments at the beginning of the experiment (24 weeks of age) were, nearly similar (ranged between 1243.60 and 1274.80 g.) with no significant differences among them. It can be observed that all dietary treatments commences among with a nearly similar initial live BW at 24 weeks of age. This may create a suitable condition to appraise the effect of dietary treatments during the subsequent periods.

Results in Table 2 showed that there were no significant differences among dietary treatment groups in both final BW and WG at the end of the experimental period (48 weeks of age). However, layers fed 300 mg ginseng/kg feed recorded the highest WG at the end of the experimental periods (345.7g.).

Results in Table (2) showed that laying hens fed the diet supplemented with 300mg ginseng/Kg recorded the highest egg production % followed by those fed the diet supplemented with 150mg ginseng /Kg feed without significant differences, while layers fed the basal (control) diet showed the lowest ($P<0.95$) percentages. The differences in egg production % due to dietary treatments effect significant ($P<0.05$) during all the experimental periods, except that from 41-48weeks of age.

Egg number values followed the same trend observed with egg production%, as layers fed the diet supplemented with 300mg ginseng / Kg feed recorded the highest egg number (hen/period) followed by those fed 150 mg ginseng / Kg feed with no significant differences, whereas layers fed the basal diet showed the lowest ($P<0.05$) egg number values. Also, the differences in egg number due to the effect of dietary treatment were significant ($P<0.05$) during all the experimental periods, except that from 41-48 weeks of age.

There were no significant differences in egg weight values due to different levels of ginseng except at the period from 24-32 weeks of age.

Egg mass values (g/hen/day/period) were significantly ($P< 0.05$) increased with feeding laying hens diets containing the high level of ginseng (300mg/kg feed) during all experimental periods. This may be due to increasing egg production values.

Table 2. Effect of dietary ginseng supplementation on body weight changes, egg production, egg number, egg weight, egg mass, feed intake and feed conversion of Sinai laying hens during the experimental periods (24-48 weeks of age).

Items \ Treatments	Control	Ginseng 150mg/kg feed	Ginseng 300mg/kg feed	Sig.
Initial body weight 24wk.(g)	1243.60±12.56	1263.30±10.14	1274.80±10.67	NS
Final body weight 48wk(g)	1585.30±24.00	1587.40±24.44	1600.50±21.26	NS
Weight gain 24-48wk(g)	341.70±25.35	324.10±25.95	345.70±22.50	NS
Egg production%(Hen-Day)				
24 -32wk	62.20±2.03 ^{b}	69.20±2.63 ^{ab}	72.00±2.35 ^{a}	*
33-40 wk	66.80±1.98 ^{b}	73.40±1.72 ^{a}	76.40±2.06 ^{a}	*
41-48 wk	58.20±1.28	60.20±1.39	62.80±1.46	NS
24-48 wk	62.40±1.11 ^{b}	67.60±1.69^{a}	70.40±1.77^{a}	*
Egg number (hen/period)				
24 -32wk	37.72±1.12 ^{b}	38.64±1.68 ^{ab}	40.32±1.12 ^{a}	*
33-40 wk	36.96±0.56 ^{b}	40.88±1.12 ^{ab}	42.56±1.12 ^{a}	*
41-48 wk	32.48±0.56	33.60±0.56	35.28±0.56	NS
24-48 wk	104.16±1.68 ^{b}	114.24±3.36 ^{ab}	117.60±3.36 ^{a}	*
***Egg weight** (g)*				
24 -32 wk	40.09±0.51 ^{b}	41.37±0.47 ^{ab}	42.05±0.53 ^{a}	*
33-40 wk.	46.08±0.73	44.90±0.41	46.92±0.54	NS
41-48 wk	49.63±0.87	48.81±0.32	50.32±0.84	NS
24-48 wk	45.27±0.59	45.03±0.21	46.43±0.63	NS
Egg mass(g/ hen/day/ period)				
24 -32 wk	24.96±1.02 ^{b}	28.65±1.26 ^{a}	30.24±0.77 ^{a}	*
33-40 wk	30.82±1.32 ^{b}	32.95±0.83 ^{ab}	35.80±0.61 ^{a}	*
41-48 wk	28.89±0.87 ^{b}	29.38±0.65 ^{b}	31.55±0.30 ^{a}	*
24-48 wk	28.27±0.83 ^{b}	30.44±0.81 ^{ab}	32.64±0.45 ^{a}	*
Feed Intake (g./hen/day)				
24 -32 wk	108.94±1.77	111.02±0.39	108.93±1.62	NS
33-40 wk	118.19±1.33	119.69±1.03	117.37±1.29	NS
41-48 wk	121.92±0.95	122.92±2.01	120.77±3.11	NS
24-48 wk	116.35±0.72	117.87±0.42	115.69±1.04	NS
Feed conversion (g feed/g egg)				
24 -32 wk	4.40±0.22^{a}	3.90±0.17^{ab}	3.61±0.11^{b}	*
33-40 wk	3.86±0.16^{a}	3.64±0.09^{ab}	3.35±0.07^{b}	*
41-48 wk	4.24±0.13^{a}	4.19±0.06^{b}	3.83±0.10^{b}	*
24-48 wk	4.13±0.12^{a}	3.88±0.10^{a}	3.57±0.04^{b}	*

a and b = Overall means having different letters exponents within the same row are significant ($P \leq 0.05$) different.
NS = No significant.

Results in Table 2 showed insignificant differences in feed intake values due to the use of different levels of ginseng during all the experimental periods. Whereas, feed conversion values were improved due to using graded

levels of ginseng supplementation at all the experimental periods. Data showed that the best feed conversion were recorded with laying hens fed the diet supplemented with 300 mg ginseng/Kg feed.

Egg quality:

The effect of experimental treatments on egg quality is presented in Table 3. The results showed that there were no significant differences in the egg shape index and yolk index due to different treatments. Results showed that when laying hens were fed diets supplemented with 300 mg ginseng/Kg feed, the average percentages of albumin wt/egg wt, shell wt/egg wt and Haugh units were significantly ($P<0.05$) improved during all the experimental periods except that of 41-48 weeks of age compared with the control group fed the basal diet. However, there were no significant differences in the pervious values between layers fed diets supplemented with 150mg ginseng /Kg feed and those fed diets supplemented with 300mg ginseng /Kg feed. Moreover, yolk wt/egg wt showed a reverse trend.

Average only values of shell thickness were improved significantly ($P< 0.05$) improved at the period of 24-32 weeks of age by dietary ginseng supplementation.

Carcass Characteristics:

Results presented in Table 4 showed that layers fed diets supplemented with 300 mg ginseng /Kg feed recorded higher ($P<0.05$) carcass wt%, giblets wt% and dressing wt % compared with those fed the basal (control) diet. However, there were no significant differences in the aforementioned characteristics between layers fed the two levels of ginseng supplementation (150 and 300 mg/Kg feed). Whereas, there were no significant differences in gizzard wt%, liver wt%, heart wt%, oviduct wt.(g) and oviduct length (cm) due to different supplemented levels of ginseng.

Blood Profiles:

The effect of dietary treatments on blood chemistry is summarized in Table 5. Total protein, albumin, globulin albumin/globulin ratio, LDL, glucose, AST, ALT, phosphorus, T_3 and testosterone values are within the normal ranges and were no significantly affected by dietary ginseng supplementations. While average values of cholesterol were higher ($P<0.05$) blood plasma of layers fed the basal diet compared with those fed diets supplemented with either 150 or 300 mg ginseng /Kg feed and the reverse was true with calcium.

Productive traits:

Semen quality traits

Effect of ginseng supplementation on semen quality of Sinai cocks of 48 weeks of age are illustrated in Table 6. Results showed that dietary

Table 3. Effect of dietary ginseng supplementation on egg quality traits of Sinai laying hens during the experimental periods (24-48 weeks of age).

Treatments / Items	Control	Ginseng 150mg/kg feed	Ginseng 300mg/kg feed	Sig.
Egg weight (g)				
24 -32 wk	45.37±1.18	45.03±0.74	46.05±0.81	NS
33-40 wk.	49.24±0.97	47.90±0.79	46.89±0.72	NS
41-48 wk	53.45±0.98	50.87±0.82	52.32±0.91	NS
24-48 wk	49.35±0.81	47.93±0.46	48.54±0.5	NS
Egg shape index(%)				
24 -32 wk	80.28±0.84	82.27±0.71	80.26±0.53	NS
33-40 wk.	79.81±0.55	80.62±0.91	80.50±0.82	NS
41-48 wk	79.31±0.94	77.98±0.90	77.86±0.99	NS
24-48 wk	79.90±0.46	80.29±0.56	79.49±0.40	NS
Yolk index(%)				
24 -32 wk	39.31±1.60	38.10±1.28	35.91±1.10	NS
33-40 wk.	46.26±0.77	45.65±2.06	47.26±0.80	NS
41-48 wk	43.21±0.87	42.17±0.71	43.18±0.82	NS
24-48 wk	42.50±0.68	41.98±0.81	41.74±0.59	NS
Albumin wt (%)to egg weight				
24 -32 wk	56.67±0.47^{b}	58.50±0.93^{ab}	59.79±0.71^{a}	*
33-40 wk.	56.27±0.52^{b}	58.33±0.68^{a}	58.66±0.70^{a}	*
41-48 wk	56.41±0.69	55.58±0.82	56.56±0.82	NS
24-48 wk	56.43±0.34^{b}	57.47±0.49^{ab}	58.36±0.40^{a}	*
Yolk wt (%) to egg weight				
24 -32 wk	32.43±0.62^{a}	29.43±0.92^{b}	28.10±0.60^{b}	*
33-40 wk.	32.87±0.54^{a}	29.34±0.64^{b}	28.91±0.63^{b}	*
41-48 wk	32.22±0.63	32.46±0.83	31.58±0.73	NS
24-48Wk	32.43±0.39^{a}	30.41±0.48^{b}	29.57±0.33^{b}	*
Shell wt (%) to egg weight				
24 -32wk	10.91±0.47^{b}	12.06±0.28^{a}	12.11±0.31^{a}	*
33-40 wk.	10.86±0.29^{b}	12.33±0.18^{a}	12.43±0.19^{a}	*
41-48 wk	11.37±0.29	11.96±0.19	11.86±0.37	NS
24-48 wk	11.15±0.26^{b}	12.12±0.14^{a}	12.08±0.19^{a}	*
Haugh units				
24 -32 wk	84.45±1.78^{b}	88.07±2.28^{ab}	91.94±1.34^{a}	*
33-40 wk.	86.00±1.20^{b}	88.30±1.34^{ab}	91.57±1.26^{a}	*
41-48 wk	81.31±1.62	82.72±1.39	85.53±1.45	NS
24-48 wk	84.03±0.88^{b}	86.36±0.90^{b}	89.50±0.68^{a}	*
Shell thickness				
24 -32 wk	0.303±0.004^{b}	0.317±0.005^{a}	0.329±0.004^{a}	*
33-40 wk.	0.320±0.010	0.323±0.007	0.307±0.008	NS
41-48 wk	0.310±0.010	0.324±0.005	0.335±0.008	NS
24-48 wk	0.311±0.005	0.321±0.003	0.324±0.004	NS

a and b = Overall means having different letters exponents within the same row are significant ($P \leq 0.05$) different.

NS = No significant.

Table 4. Effect of dietary ginseng supplementation on carcass characteristics of Sinai laying hens at 48 weeks of age.

Items \ Treatments	Control	Ginseng 150mg/kg feed	Ginseng 300mg/kg feed	Sig.
Pre-slaughter wt (g)	1676.00±42.67	1613.00±48.47	1657.00±36.43	NS
Carcass wt (%)	62.46±0.66^{b}	64.48±0.78^{ab}	65.17±0.78^{a}	*
Gizzard wt (%)	1.70±0.11	1.71±0.06	1.85±0.06	NS
Liver wt (%)	2.29±0.07	2.40±0.14	2.56±0.12	NS
Heart wt (%)	0.50±0.05	0.49±0.03	0.54±0.03	NS
Giblets wt (%)	4.49±0.11^{b}	4.60±0.15^{ab}	4.95±0.13^{a}	*
Dressing wt (%)	66.94±0.63^{b}	69.07±0.84^{a}	70.12±0.72^{a}	*
Oviduct Wt (g)	2.26±0.20	2.49±0.15	2.66±0.11	NS
Oviduct length (cm)	44.80±2.93	47.80±2.29	50.00±1.28	NS

a and b = Overall means having different letters exponents within the same row are significant (P≤0.05) different. **NS =** No significant.

Table 5. Effect of dietary ginseng supplementation on blood profiles of Sinai laying hens at 48 weeks of age.

Items \ Treatments	Control	Ginseng 150mg/kg	Ginseng 300mg/kg	Sig.
Total protein (mg/dl)	4.97±0.21	5.05±0.16	5.33±0.23	NS
Albumin (mg/dl)	2.23±0.08	2.46±0.11	2.50±0.11	NS
Globulin (mg/dl)	2.74±0.21	2.59±0.17	2.82±0.20	NS
Albumin/ globulin ratio	0.86±0.08	0.99±0.09	0.93±0.08	
Cholesterol (mg/dl)	160.49±6.01^{a}	131.67±8.87^{b}	126.73±9.32^{b}	*
LDL	108.41±2.33	107.67±3.14	104.12±4.32	NS
Glucose (mg/dl)	156.25±5.68	158.99±2.13	153.98±4.18	NS
AST (nmol/l)	0.92±0.01	0.89±0.02	0.86±0.02	NS
ALT (nmol/l)	0.57±0.02	0.55±0.01	0.55±0.01	NS
Phosphorus (mg/dl)	3.30±0.20	3.49±0.18	3.74±0.12	NS
Calcium (mg/dl)	10.85±0.19^{b}	10.93±0.19^{b}	11.62±0.28^{a}	*
T3 (ng/dl)	146.96±8.64	161.63±12.95	157.45±6.37	NS
Testosterone (ng/dl)	3.18±0.29	3.69±1.07	3.84±0.81	NS

a and b = Overall means having different letters exponents within the same row are significant (P≤0.05) different. **NS =** No significant.

Table 6. Effect of dietary ginseng supplementation on semen characteristics of Sinai cocks at 48 weeks of age.

Items \ Treatments	Control	Ginseng 150mg/kg feed	Ginseng 300mg/kg feed	Sig.
Semen ejaculate volume (ml)	0.57±0.01	0.57±0.01	0.59±0.01	NS
Hydrogen-ion concentration (pH)	7.25±0.07	7.26±0.06	7.26±0.07	NS
Sperm motility (%)	63.00±2.55	68.00±4.06	72.00±2.55	NS
Dead spermatozoa (%)	23.40±1.44 [a]	20.80±1.16 [ab]	16.80±1.36 [b]	*
Sperm abnormalities (%)	16.80±0.97 [a]	12.00±0.89 [b]	11.60±2.11 [b]	*
Sperm cell concentration(X 10^9/ml)	3.36±0.11 [a]	3.92±0.18 [a]	4.22±0.21 [a]	*

a and b = Overall means having different letters exponents within the same row are significant (P≤0.05) different. NS = No significant.

supplementation with either 150 or 300 mg ginseng / Kg feed improved semen quality compared with those of control group. Dietary supplementation with ginseng significantly (P<0.05) degreased dead spermatozoa% and abnormal spermatozoa%, while it increased (P<0.05) sperm cell concentration compared with those of the control group. Whereas, semen ejaculate volume pH and sperm motility % were not affected by dietary supplementation with ginseng.

Fertility and hatchability

Fertility and hatchability/total egg percentages were significantly (P≤0.05) by increased dietary ginseng supplementation compared with those of the control group (Table 7).

Table 7. Effect of dietary ginseng supplementation on reproductive performance of Sinai laying hens at 48 weeks of age.

Items \ Treatments	Control	Ginseng 150mg/kg feed	Ginseng 300mg/kg feed	Sig.
Fertility eggs (%)	82.22±1.11[b]	85.56±1.11[ab]	91.11±2.94[a]	*
Hatchability/Total eggs(%)	63.33±1.92[b]	70.00±1.92[ab]	72.22±2.22[a]	*
Hatchability/Fertility eggs %	77.06±2.54	81.79±1.43	79.55±4.72	NS

a and b = Overall means having different letters exponents within the same row are significant (P≤0.05) different. **NS =** No significant.

Economical efficiency:

The effect of different dietary levels of ginseng on economical efficiency of egg production is presented in Table 8. Egg production (egg mass/hen) and feeding cost are generally among the most important factors involved in the achievement of maximum efficiency of egg production. The economical efficiency values were calculated according to the prevailing market (selling) price of both diets and egg. Results showed an improvement in

Table (8): Effect of dietary ginseng supplementation on economical efficiency of Sinai laying hens during the experimental periods (24-48 weeks of age).

Treatments	Periods (weeks)	Total feed intake (Kg/bird)	Cost of kg feed (LE)	Total feed cost (LE)[A]	Total egg mass (Kg)	Egg market price (LE)[B]	Net return (LE)[C]	Economic efficiency EE (%)[D]
Control	24-32	6.101	1.90	11.59	1.398	13.98	2.39	20.62
	33-40	6.619	1.90	12.58	1.726	17.26	4.68	37.20
	41-48	6.823	1.90	12.96	1.618	16.18	3.22	24.85
	24-48	19.543	1.90	37.13	4.749	47.49	10.36	27.90
150 mg ginseng/ Kg feed	24-32	6.217	1.96	12.19	1.604	16.04	3.85	31.58
	33-40	6.703	1.96	13.14	1.845	18.45	5.31	40.41
	41-48	6.884	1.96	13.49	1.645	16.45	2.96	21.94
	24-48	19.804	1.96	38.82	5.114	51.14	12.32	31.74
300 mg ginseng /Kg feed	24-32	6.100	2.02	12.32	1.693	16.93	4.61	37.42
	33-40	6.573	2.02	13.28	2.005	20.05	6.77	50.98
	41-48	6.763	2.02	13.66	1.767	17.67	4.01	29.36
	24-48	19.436	2.02	39.26	5.484	54.84	15.58	39.68

A: Total feed cost = Feed intake *Cost of kg / feed.
B: Egg market price = Total egg mass *Cost of kg egg (10 LE)
C: Net return = Differences between egg market price and total feed cost.
D: Economical efficiency = (Net return / total cost) × 100.

average values of net revenue, economical efficiency due to feeding laying hens on diets supplemented with 300mg ginseng/Kg feed followed by layers fed 150 dietary ginseng / Kg feed as compared to those fed the control diet.

DISCUSSION:

As demonstrated else where, ginseng is one of the most valuable medicinal herbs in East Asian countries. It was previously found that its most notable features are modulation of the immune system, and activities against stress effect, cancer and diabetes (Vogler *et al*., 1999 and Dey *et al*., 2003). Kiefer and Pantuso (2003) reported that ginseng may improve psychological function and immunity.

The effects of ginseng on the body weight, egg production performance and egg quality are shown in Tables 2 and 3. As expected, the levels (150 mg or 300 mg / kg) of ginseng supplementation did not affect BWG and FI compared with control treatment, the reason is likely to be the negative effect of lower dosage supplementation on FI and growth performances, similarly Jenkins and Atwal (1994), who suggested that dietary saponins had adverse effects on feed consumption and growth of chicks because of their bitter taste (Milgate and Roberts, 1995). This may be due to the effects of dietary ginseng supplementation on layer hens go to improve egg production performance.

However, dietary ginseng treatments increased egg production compared to control group, which is in agreement with the study of Jang et al., (2007), who suggested that dietary ginseng increased the egg production and egg quality. Similar results were reported by Yan *et al.* (2011), who suggested that dietary supplementation with ginseng meal increased egg production in laying hens. Ginseng is one of the most valuable mystic medicinal herbs in many countries and has long been considered as an herbal remedy for the prevention and treatment of various diseases. It is generally suggested that the bioactive components of ginseng were saponins, antioxidants, peptides, polysaccharides, alkaloids, lignans, and polyacetylenes, which are believed to have immune-stimulatory, anti-fatigue and hepato-protective physiological effects (Jo *et al*., 1995). Various studies have suggested that saponins and polysaccharides derived from ginseng could enhance immunity in vitro and perform a variety of functions, including immune-modulation, anti-tumor, and anti-oxidant actives (Park, 1996 and Zhang *et al*., 2009). Therefore, the reason for increasing egg production is likely to be the improved health status, increase oviduct weight and oviduct length of birds fed on diets supplemented with ginseng. Egg mass and feed conversion values were significantly affected by supplementation of ginseng as compared with control group during all the experimental periods. Theses results are in agreement with those obtained by Park *et al*. (2005) who showed that feed efficiency of birds fed 0.4% dietary wild ginseng cultures by

products was improved as compared with that of other groups fed 0.0 , 0.8m 1.6 and 3.2 % ginseng. On the other hand, Yang et al., (1994) reported that supplementation of ginseng (0.0, 2.0, 4.0 and 8.0% of the diet) had no effect on feed conversion efficiency. Data in Table 3 showed that relative weights of albumin, yolk, shell and Haugh units were significantly affected ($P<0.05$) by dietary ginseng level, while, egg shape index and yolk index were not significantly affected. This may be due to the increase of shell wt.(%) due to increase in levels of plasma calcium and phosphorus in the same groups fed ginseng as compared with control group. These results agreed with those reported by Jang *et al.* (2007) who found that egg albumen height and Haugh units were significantly improved by dietary supplementation of ginseng (2.5 or 5.0%) as fermented wild ginseng culture byproduct compared to the control. However, Lee *et al.* (2008) found that egg quality was higher in younger hens (20 to 30 weeks) with dietary ginseng supplementation (0.5 and 1% of the diet) based on egg weight, albumin height and Haugh units, but there were no effects in older hens (60 to 70 weeks). Ao *et al*. (2011) reported that supplementation of fermented red ginseng extract from 1 to 4 g/kg diet, did not influence egg quality of ISA brown laying hens from 35-43 weeks of age.

Layers fed supplemented diet with ginseng evidenced lower levels of cholesterol compared with those fed on control diet (Table 4). It is previously suggested that saponins can form insoluble complexes with cholesterol because of their hydrophobic portion (the aglycone or sapogenin), which could be associated (lipophilic bonding) with the hydrophobic sterol nucleus (Lindahl *et al*, 1957). Oakenfull and Sidhu (1989) noted that saponins reduced the blood cholesterol levels in chickens, and considered these effects to be a consequence of the binding interaction between saponins and cholesterol in the intestinal bile. Qureshi *et al*., (1983) also suggested that dietary ginseng reduced the β-hydroxy-β-methylglutaryl-CoA (HMG-CoA) reductase activity and cholesterol 7α-hydroxylase activity compared with the diet without ginseng, and suggested that ginsenoside (saponins) is the active agent for the suppression of cholesterogenesis and lipogenesis.

Therefore, the reduced cholesterol levels in ginseng treatments may corroborate the relationship between saponins and cholesterol, which is in line with our previous study in which the ginseng culture by product decreased the cholesterol concentration in laying hens (Jang *et al*., 2007). These findings are consistent with those of earlier studies, in which dietary ginseng impaired avian hepatic cholesterogenesis and reduced the serum total cholesterol and triglyceride levels (Muwalla and Abuirmeileh, 1990 and Qureshi *et al*., 1983).

In addition, Calcium level was increased in response to ginseng supplementation. This may be due to increased of plasma calcium levels back to the effects of using of ginseng as affected in improvement of bone resistance.

Results in Table 5, showed significant differences for relative weights of carcass, giblets and dressing percentages among groups fed diets supplemented with ginseng when compared with the control group. Our results indicated the superiority for groups fed with ginseng compared with the control group. These findings disagree with those obtained by Kim *et al*. (2002) who reported that supplementation of ginseng (5% of the diet) had no effect on carcass weight and carcass yield in Korean Native Chicken.

Results in Table 6 showed that semen quality at 48 weeks of age as was improved a result of adding ginseng into diets compared with control group. This may be due to believed exert immune-stimulatory, anti-fatigue and hepato-protective physiological effects (Wu and Zhong, 1999).

Fertility and hatchability percentages of total eggs increased significantly by dietary supplementation of ginseng (Table 7). Increasing fertility and hatchability percentages due to ginseng supplementations may be due to the improved in semen quality and egg albumen quality.

In conclusion, dietary supplementation with ginseng meal increased egg production, improved feed conversion, egg quality, dressing (total edible), reproductive performance, economical efficiency and reduced serum cholesterol concentrations in laying hens. It is suggested that the addition of ginseng meal could positively affect the production performance of laying hens from 24 weeks because of its immune-stimulatory, hepato-protective and anti-oxidant activities. Therefore, we hypothesized that the ginseng meal could be used as a promoter to improve the production performance during the laying period**.**

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تأثير إضافة الجنسنج للعلائق علي الصفات الإنتاجية والتناسلية لسلاله دجاج سيناء البياض

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استخدم في هذه الدراسة عدد ١٥٠ دجاجة من نوع سينا البياض عمر ٢٤ أسبوع – قسمت الطيور عشوائياً إلي ثلاث مجاميع كل مجموعة كان بها ٥٠ دجاجة وخمس ديوك في خمس مكررات وكل مكررة بها ١٠ دجاجات وديك واحد. تم إضافة الجنسنج بمعدل ١٥٠ ملجم، ٣٠٠ ملجم لكل كجم عليقة. قدمت المياه والعلائق بصورة حرة مع

توفير إضاءة مقدراها ١٦ ساعة يومياً خلال فترة التجربة التي استمرت ٢٤ أسبوع (ثلاث مراحل وبكل مرحلة ٨ أسابيع) من عمر ٢٤ حتى ٤٨ أسبوع من العمر.

أظهرت النتائج أنه لا توجد اختلافات معنوية في وزن الجسم والزيادة المكتسبة في وزن الجسم والغذاء المستهلك و egg shape index و Yolk index نتيجة لتغذية الدجاج البياض علي علائق مضاف إليها الجنسنج بينما كان هناك اختلاف معنوية في إنتاج البيض وكتلة البيض ومعامل التحويل الغذائي ووزن البياض والقشرة و Haugh units نتيجة لتغذية الدجاج البياض علي علائق مضاف إليها الجنسنج مقارنة بعليقه المقارنة وذلك خلال المرحلة الكلية (٢٤-٤٨ أسبوع من العمر). أيضاً كان هناك تحسن في وزن البيض و Shell thickness نتيجة لتغذية الدجاج البياض علي علائق مضاف إليها الجنسنج في المرحلة المبكرة فقط لإنتاج البيض (٢٤-٣٢ أسبوع من العمر) بينما خلال المراحل من ٣٣-٤٠ و ٤١-٤٨ و٢٤-٤٨ أسبوع من العمر أظهرت النتائج أنه لا يوجد اختلافات معنوية في وزن البيض و Shill Thickness نتيجة لتغذية الدجاج البياض علي علائق مضاف إليها الجنسنج مقارنة بعليقه المقارنة.

أوضحت النتائج أنه لا توجد اختلافات معنوية في صورة الدم للبروتين الكلي والالبيومين والجلوبيولين ونسبة الألبيومين إلي الجلوبيولين LDL والجلوكوز و AST و ALT والفوسفور و T3 والتسترون نتيجة لإضافة الجنسنج في علائق الدجاج البياض بينما كانت هناك فروق معنوية في الكولسيترول والكالسيوم عند زيادة إضافة نسبة الجنسنج للعليقة. أظهرت النتائج أنه لا توجد فروق معنوية في وزن القونصة والكبد والقلب كنسبة مئوية من وزن الطائر قبل الذبح. بينما كانت هناك فروق معنوية في وزن الذبيحة و giblets (القونصة + الكبد + القلب) و Dressing (الذبيحة + القونصة + الكبد + القلب) وكذلك صفات السائل المنوي و % للخصوبة والفقس التي تحسنت نتيجة لإضافة الجنسنج.

أوضحت النتائج أن هناك تحسن في الربح الصافي وكذلك الكفاءة الاقتصادية نتيجة تغذية الدجاج البياض علي علائق مضاف إليها الجنسنج.

التوصيـــة: نستخلص من هذه النتائج أن إضافة ٣٠٠ ملجم جنسنج إلي علائق دجاج سينا البياض حسن من الأداء الإنتاجي وصفات البيض وكذلك بعض مكونات الدم وصفات الذبيحة وصفات السائل المنوي والخصوبة والفقس والكفاءة الاقتصادية.