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EFFECT OF DIETARY GINSENOSIDES AND GINSENG SUPPLEMENTATION ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE IN GIMMIZAH CHICKENS 2- DURING LAYING PERIOD

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ABSTRACT: The present study was carried out to determine the effect of dietary ginsenosides and ginseng supplementation on productive performance, physiological and immunological parameters in Gimmizah chickens. A total number of 210 (189 laying hens and 21 cocks) at 32weeks of age, were randomly divided into 7 treatment groups. Each treatment represented by 3 replicates each containing 9 hens and 1 cook. The first group was fed the basal diet without supplementation (control). While, the second, third and fourth groups were fed the basal diet supplemented with ginsenosides (GnD) at 100, 200 and 300 mg/kg diet, respectively. The fifth, sixth and seventh groups were fed the basal diet supplemented with ginseng (Gn) at 100, 200 and 300 mg/kg diet, respectively. All birds received feed and water *ad-libitum* throughout the experimental period (32 -44 weeks of age).

Results obtained showed that: The chickens fed the basal diet supplied with 300 mg Gn/kg diet had significant results for egg production, egg mass, feed conversion ratio, and fertility percentage compared with those in the other experimental groups. Supplementation of chicken's diet with GnD and Gn significantly improved antioxidant status and significantly increased estrogen and progesterone hormones concentrations compared to control group. In conclusion, supplied Gimmizah chickens diet with ginseng or ginsenosides at 300 mg/kg diet improved productive and reproductive performance and the immune status during laying period.

Key Words: Laying hens, Ginsenosides, Ginseng, blood parameters, egg quality.

INTRODUCTION

Panax ginseng, which translated from the Greek word panacea means "cure all", has been used in oriental cultures as a medicine and aphrodisiac for over 5,000 years. Red ginseng was prepared by steamed ginseng at 98-100 C^0 then dried. It is widely used in oriental medicine as a remedy for the treatment of various diseases, including anemia, insomnia, diabetes mellitus, gastritis, abnormalities in blood pressure, overstrain, dyspepsia and fatigue and so on.

To date, animal experiments study have shown that the ginseng reduced blood pressure and improve cardiovascular dysfunction (Kang *et al*., 1995) and had a relaxing effect on vascular smooth muscle and anti-inflammatory properties as well as anti-stress effect (Peng *et al.*, 1995) , in addition to its inhibited calmodulin-dependent phosphodiesterase (Sharma and Kalra, 1993).

Several researches documented that ginseng contains saponins, antioxidants, polysaccharides, peptides, lignans, alkaloids, polyacetylenes antioxidants, peptides and polysaccharides. Among these, saponins (ginsenoside) are considered to be the principal bioactive ingredients (Jo *et al*., 1995; Sticher, 1998; Palazon *et al*., 2003) and are believed to exert immune-stimulatory, anti-fatigue and hepatoprotective physiological effects (Wu and Zhong, 1999). Ginseng has been used as one of the most well-known herbal medicines for a long time (Kiefer and Pantuso, 2003). Ginsenosides, or ginseng saponins, are believed to be the major active component in the ginseng root (Song and Hu, 2009).

Recently, physiological studies have shown that ginseng affecting sexual effectiveness and increasing fertility through its effect on sex hormones and their receptors (Park et al., 2017). Saponins from ginseng stems and leaves (GSLS) are readily available at a lower cost, compared with the ginseng roots (GS-R), due to the recycling of the stems and leaves, which, in the past, were discarded as waste after harvesting the roots (Xie *et al.*, 2005).

Also, numerous studies have demonstrated the pharmaceutical effects of *Panax ginseng* on physical, chemical and biological stress (Shim *et al.*, 2010), metabolism (Lim *et al.*, 2009) and systemic immune function (Spelman *et al.*, 2006). Moreover, Zhang *et al.* (2008) and Lim *et al*. (2009) confirmed that ginseng complex contributed to the improvement in the parameters evaluated by its antimicrobial and antioxidant potential.

Ginsenosides are frequently used as main index for ginseng product evaluation. Methods have been developed for simultaneous analysis of the main ginsenosides. Possessing a variety of pharmacological activities, including anti-inflammatory (Wang *et al*., 2013), immunomodulatory activities and antioxidant (Lee *et al*., 2012). Recently, GSLS have been found to be an immune-stimulating agent in chickens. Zhai *et al.* (2011 a; b; 2014) reported that orally administration of GSLS significantly enhanced the immune responses to vaccination against Newcastle disease, avian influenza, and infectious bursal disease for chickens. Wei *et al.* (2012 a; b) found that ginsenosides Rg3 (a fraction of saponins from Gn) is active in both immune-stimulating and antioxidant effects.

Considering the previous benefits, we hypothesize that ginseng and ginsenosides may exert the positive effects on laying chickens performance. Therefore, the objective of this study is to investigate the effect of graded levels of dietary ginseng and ginsenosides

supplementation on productive, reproductive performance and the traits meat quality of Gimmizah chickens.

MATERIALS AND METHODS

This study was carried out at El-Sabahia Poultry Research Station (Alexandria), Animal Production Research Institute (APRI), Agricultural Research Center, Egypt.

Birds, management and experimental design

A total of one hundred and eighty nine laying hens and twenty one cocks of Gimmizah strain at 32 weeks of age were weighed and randomly distributed into seven experimental groups, 30 birds per group (27 hens and 3 cocks), each with three replicates (9 hens and one cock). All birds were housed under similar hygienic and managerial conditions. Throughout the experimental period (32 -44 weeks of age), feed and fresh water were available all the time. And in the same time 35 cocks were taken and distributed into seven treatment groups and housed in individual cage for semen evaluation. The first group was fed the basal diet without supplementation (control). The second, third and fourth groups were fed the basal diet supplemented with ginsenosides (GnD) at 100, 200 and 300 mg/kg diet, respectively. The fifth, sixth and seventh groups were fed the basal diet supplemented with ginseng (Gn) at 100, 200 and 300 mg/kg diet, respectively. Basal diet covered the nutrient requirements according to Feed Composition Table for Animal and Poultry Feedstuffs in Egypt, as shown in Table (1). Vaccination and medical care were done according to common veterinary care under veterinarian's supervision.

Measurements

Egg production (EP) and egg weight (EW) were recorded daily for each replicate and records of egg mass (EM) was calculated by multiplying egg number by average egg weight. Feed intake (FI) was recorded weekly. Egg production was calculated during the production period, and feed conversion ratio (FCR) was calculated as g of feed required per g of egg mass.

Fertility and Hatchability Percent:

Hatching eggs were collected daily from each experimental group three times at 38, 40 and 42wks of age. Hatched eggs representing the seven experimental dietary groups were incubated in Egyptian- made incubator at 37.8°C and 55%RH during incubation and transferred to hatcher operated at 37.2°C and 65% RH. Macroscopic fertility was determined as percentage of fertile eggs from total eggs set.

External and internal egg quality:

At 36, 40 and 44 wks of age, 15 eggs/group were used to estimate the egg quality weight of yolk, albumen, and eggshell (as percentage to egg weight), and eggshell thickness without egg shell membranes (mm).Washed shells were left for 72 hrs at environmental temperature, dried, individually weighed, and their relative weights were calculated as percentage of egg weight. Egg shell thickness was measured for three equatorial regions of ten eggs using a manual micrometer. Then , records of yolk index (YI) were measured according to Funk (1948), Haugh unit score (HU) according to Haugh (1937) and surface area (SA) according to Carter and Jones (1970).The egg yolk visual color score was determined by matching the yolk with one of the 15 bands of the "1961,Roche Improved Yolk Color Fan".

Biochemical blood and hormones assay:

At the end of the experiment, (at 09.00 AM), two blood samples (3 ml, each) were withdrawn from the brachial vein, (one with anticoagulant to separate plasma and the other one without to separate serum) of three hens / replicate. Samples of serum and plasma were stored at (-20°C) until analysis. Plasma estrogen (E_2) and Progesterone (P_4) were analyzed using radioimmunoassay (RIA) kits manufactured by Diagnostic systems laboratories USA by Automatic 1275 MiniGamma Counter LKB according to the method described by Canez *et al.* (1992). Estrogen and Progesterone ratio (E_2/P_4) was calculated. Plasma total lipids, cholesterol, HDL and LDL were determined using commercial kits produced by Diamond Diagnostics Company (29 Tahreer St. Dokki Giza Egypt).The activity of serum aspartate amino transferase (AST), and serum alanine amino transferase (ALT), were determined using spectrophotometrically. Serum total antioxidant capacity (TAC) and malondialdehyde (MDA) were colorimetrically determined using commercial Kits. The phagocytic activity (PA) and phagocytic index (PI) were measured as suggested by Leijh *et al.* (1986).

Semen evaluation:

At 40 weeks of age, semen samples were collected from cocks of each treatment once weekly by abdominal massage technique. Physical properties of semen such as ejaculate volume (ml), sperm forward motility (%) and live sperm (%) were determined. Sperm concentration was measured by using spectrophotometer at wave length 535 nm according to El-Sahn and Khalil (2005).

Slaughter traits:

At the end of experimental period, three hens per treatment (one from each replicate) were randomly taken and slaughtered. Data of carcass traits (including eviscerated carcass, gizzard, liver, heart, spleen, intestinal weight, and pancreas) and abdominal fat were scaled and calculated as a percentage of live body weight. Also was measured Ovary, oviduct, total ovarian follicle (TOF), large yellow follicle (TYF) were removed immediately, counted and then weighed separately to the nearest gram. The weights of these organs were expressed as the percentage of live weight. Also was measured intestinal length.

Economic efficiency

Economic efficiency of egg production was calculated from the input-output analysis which was calculated according to the price of the experimental diets and eggs production during the year of 2016. The values of economic efficiency were calculated as the net revenue per unit of total cost.

Statistical analysis

Data were statistically analyzed using one way ANOVA of SAS® (SAS Institute, 2004). Differences among treatment means were estimated by Duncan's multiple range test (Duncan, 1955). The following model was used to study the effect of treatments on the parameters investigated as follows: $Yij = \mu + Ti + eij$. Where: Yij = an observation, μ = overall mean, Ti = effect of treatment (i=1, 2, 3, 4, 5, 6 and 7) and eij = experimental random error.

RESULTS AND DISCUSSION

Productive and reproductive traits

As shown in Table (2) the average initial live body weight (BW) values of laying hens of different treatments at the beginning of the experiment (32 weeks of age) were, nearly similar and ranged

between 1610 and 1630 g, with no significant differences among them. 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 final BW and BW change at the end of the experimental period (44 weeks of age). The present results are in agreement with the finding of Azazi *et al.* (2011) who observed 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) due to feeding laying hens on diets supplemented with ginseng. Also, Yildirim *et al.* (2011) observed that supplementation of layer diet with (*Panax ginseng* C.A. Meyer) root extract (PGRE) had no significant effects on body weight and body weight gain.

Egg production percentage (EP %) for layer groups fed diet supplied with both additives were significantly increased during the whole experimental period compared with unsupplied group (control).However, the group supplied with 300 mg Gn /kg diet recorded the highest significant for egg production (74.44%). The reasons for the increased in egg production may be due to mixture of ginsenosides that can activate either or both estrogens receptor and/or progesterone receptors according to Furukawa *et al.,* (2006). Egg weight (EW) for layer groups fed diet supplied with both additives were significantly increased during the whole experimental period compared with control group. However, the group supplied with 200 and 300 mg Gn /kg diet recorded the highest significant values for egg weight (53.12 and 53.05g, respectively) followed by those supplied with 300 mg GnD /kg diet and 100 mg Gn /kg diet (52.55 and 52.37g, respectively). These results are in agreement with Yan *et al*. (2011 a, b) who they observed that dietary supplementation with wild Ginseng adventitious root meal (basal diet + 1% and + 2%) increased ($P \leq 0.05$) egg production and egg weight in laying hens at 27 weeks of age. A similar response was observed on egg mass (EM) due to supplementation of layer diet with both additives. However, the group supplied with 300 mg Gn /kg diet had significantly the highest EM (39.57 g/h/d) compared with those in the other groups. The present results are in agreement with the finding of Azazi *et al*. (2011) who observed that there was an improvement in egg mass due to feeding laying hens on diets supplemented with ginseng at early laying stage. With respect to feed intake (FI) for group fed diet supplied with 300 mg Gn /kg diet was significantly decreased during the whole experimental period compared with those in the other groups. Moreover, the group supplied with 300 mg Gn /kg diet recorded a significant lowest feed intake (119.66 g/h/d) followed by those supplied with 200 mg Gn /kg diet and 300 mg GnD /kg diet (127.25 and 127.99 g/h/d, respectively). However, the inclusion of 300 mg Gn /kg diet significantly improved feed conversion ratio (FCR) by 31.61% compared with those in hens fed the control diet. While there were no significantly different among the other treatment groups compared with control group. The present results are agreement with the finding of Simonová *et al*. (2008) who showed that the application of ginseng extract had a beneficial effect on feed conversion ratio and feed consumption. Supplementation of layer

diets with both additives by different levels significantly improved fertility, hatchability of total eggs percentages, hatchability of fertile eggs percentages and baby chick weight compared with the control group (Table 2). The chickens fed diet supplied with 300 mg either Gn or GnD /kg diet recorded the highest fertility percentages (96.67 and 95.83 %, respectively). These observation are in agreement with the finding of Azazi *et al*. (2011) who observed that fertility (%) and hatchability (%) were significantly increased by dietary ginseng supplementation (150 and 300 mg ginseng/Kg) compared with those of the control group.

On the other hand, the chickens fed diet supplied with 300 and 200 mg Gn /kg diet recorded the best hatchability percentage of fertile eggs (96.85 and 95.90 %, respectively). While, the chickens fed diet supplied with 300 mg Gn/kg diet recorded the best hatchability percentage of total eggs (93.61%). Furthermore, baby chick weights for the groups fed both additives at different levels with the exception of 100 mg/kg diet group were significantly increased compared with the control group (Table 2). However, the chickens fed diet supplied with 300 mg Gn /kg diet recorded the best baby chick weights (40.00g). From this results the laying hens fed diet supplied with 300 mg ginseng /kg diet recorded the best EP, EW, EM, FCR, fertility, hatchability and baby chick weights compared with those fed the control diet.

Egg quality

Supplementation of layer diets with both of ginseng and ginsenosides at different levels significantly improved Haugh unit Score compared with the control. Results showed that albumen weight, yolk weight, egg shape index, yolk index, shell thickness (mm), yolk color score and SA were not significantly differed by supplementing both additives at different levels compared with the control group Table (3). These observation are in agreement with the finding of Yan *et al*. (2011 a, b) and Azazi *et al*. (2011) who showed that there were no significant differences in egg shell thickness, egg shell breaking strength, egg shape index, yolk index values due to feeding laying hens on diets supplemented with Ginseng as compared with the control diet, during period (24-48 weeks of age).

Dressed carcass weight, inner and reproductive organs:

Results for carcass traits as affected by both ginseng and ginsenosides at different levels (100, 200 and 300) are shown in Table (4). The results indicated that The best significantly improvement in carcass (63.37 %), spleen (0.235 %), ovary (2.769%), number large yellow folic (4.93), weight yellow folic (2.258 %) and oviduct length (81.17 cm) were recorded for the birds fed diet supplied with 300 mg Gn /kg diet compared with that for the other experimental groups. However, supplementation of chicken diets with both additives by different levels had no significant effects on the relative weights of gizzard, liver, heart, pancreas, intestinal weight and intestinal length and relative weights of oviduct weight and abdominal fat.

Biochemical constituents

Indices of liver enzymes:

The biochemical contents of serum liver enzymes functions are presented in Table (5). Results revealed that dietary supplementation of GnD and Gn at 100,200 or 300 mg/Kg diet layer diet had significantly decreased aspartate amino transferase (AST) and alanine amino transferase (ALT) compared with those

fed on control diet. This observation may be due to that GnD and Gn may believe to exert an immune-stimulatory, antifatigue and hepato-protective (WU and Zhong, 1999 and Azazi *et al*., 2011). However, supplied the laying hens diet with 300 mg Gn /kg resulted a significant ($P<0.05$) lowest serum AST compared to the other experimental groups. While, there were no significant effect on serum ALT among the groups supplied with the both additives at different levels, regardless the control group. These results are disagree with Kang *et al*. (2016) who supplied a commercial layer diet with two levels of red ginseng by-product (5.0 and 10.0 g/kg diet) and found that there were no differences in aspartate aminotransferase, and alanine aminotransferase, these results may be due to difference in source or form of ginseng supplementation.

Plasma lipid profile:

Results of Table (5) revealed that plasma lipid profile including total lipids, HDL and HDL/LDL ratio were significant, while total cholesterol and LDL were not affected. However, hens fed 300 mg Gn /kg diet showed highest concentration of total lipids and HDL and HDL/LDL ratio compared to the control group while the others were almost similar. Additionally, plasma total lipids decreased significantly ($P<0.05$) with decreasing ginsenosides and ginseng levels. This is inconsistent with some results of prior studies. (Young *et al*., 2014, Bong *et al*., 2011, Ao *et al*., 2011 and Jang *et al*., 2007) who found that increasing levels of red ginseng marc (0.5%, 1% and 2%) showed reducing in the total cholesterol and low-density lipoprotein cholesterol (LDL) levels, and increasing in the high-density lipoprotein (HDL) cholesterol levels compared to the control . This is presumably because of the ability of saponins to form insoluble complexes with cholesterol in the digest, which in turn inhibits intestinal cholesterol absorption and endogenous cholesterol synthesis. Also, the observed increase in serum HDL and HDL/LDL ratio when ginsenosides and ginseng were supplemented to the diet might be caused by the inhibition of cholesterol and/or bile acid absorption as reported with Oakenfull and Sidhu (1990).In general, saponins in red ginseng marc are known to exhibit biological activity (Ao *et al*. 2011a). In addition, Ao *et al*. (2011b) indicated that the effect of dietary saponins on cholesterol levels might be associated with species, quantity of dietary supplementation, different sources and processing methods. While, saponins (bioactive ingredients) have been found to have a positive effect on the immune system (Ilsley *et al*. 2005).

Serum antioxidant and lipid peroxidation status:

Data for the biochemical constituent of serum total antioxidant capacity (TAC) and lipid peroxidation status (malondialdehyde, MAD) of Gimmizah laying hens are presented in Table (6). There were significant effect of supplemented GnD and Gn on TAC and MAD. Supplied laying hen's diet with 300 mg Gn/kg showed highest TAC activity compared to other groups which had no significant differences among them. The malondialdehyde status for hen supplied with 300 mg GnD or Gn /kg were statistically equal and they showed significantly lower activity compared to those fed control diet. These results are in agreement with Chen *et al*. (2015) who concluded that oral administration of ginseng stem-leaf saponins (GSLS) in drinking water had an antioxidative property, as evidenced by increasing total

antioxidant capacity, as well as decreasing the malondialdehyde. Therefore, GSLS could be a promising agent to be used against oxidative stress in the poultry industry.

Plasma estrogen, progesterone and estrogen/progesterone ratio:

Data for the impact of ginsenosides and ginseng supplementation on plasma estrogen (E_2), progesterone (P_4) and E_2/P_4 ratio are shown in Table (6). Laying hens fed level either 300 mg GnD or Gn/kg showed significantly ($P<0.05$) higher plasma P_4 than those fed 100 mg GnD or Gn /kg and control diets. On the other hand, hens fed 200 mg or 300 mg Gn /kg and 300 mg GnD /kg had significantly lower plasma E_2 than those fed other diets which in turn showed almost similar values. In addition, laying hens fed either 300, 200 mg Gn /kg or 300, 200 mg GnD /kg had significant lower plasma E_2/P_4 ratio than those fed with other diets 100 mg GnD or Gn which displayed intermediate plasma E_2/P_4 ratio compared to control group. With respect to the ratio of E_2 to P_4, it is considered as a better parameter for estimating explain the mode of action of these two hormones on egg production egg production rather than either the P_4 or E_2 alone (Holt *et al*., 1983 and Leszezynskiz *et al*., 1983).

Constituents of immune indices:

Results presented in Table (7) show a significant effect of supplied ginsenosides or ginseng on phagocytic activity (PA), phagocytic index (PI), Immunoglobulin G (IgG), Immunoglobulin M (IgM) (type of antibody, released by plasma B cells, protects the body from infection such as viruses, bacteria, and fungi) and Haemagglutination inhibition of Newcastle disease virus (HINDV). These results indicated that supplied laying hen diets with 200 or 300 mg Gn /kg had significantly higher PA and PI compared to control group. Also, the groups supplied with 300 mg GnD /kg exhibited higher PA than control group, in the same time, other groups exhibited intermediate PA. Moreover, feeding 200 mg or 300 mg Gn /kg recorded a significant PI compared with other groups which were not significant difference between them. On the other hand, feeding hens with 200 or 300 mg Gn /kg significantly increased IgG, IgM and Haemagglutination compared to the control group. In this respect, Kang *et al*. (2016) supplied a commercial layer diet with two levels of red ginseng by-product (RGB, 5.0 and 10.0 g/kg diet) and they found that RGB supplementation increased ($p<0.05$) serum IgG and IgM concentrations and the increasing were 10.5% and 29.14%, respectively higher than those in the non-treated group, respectively. It was previously suggested that ginseng may improve physiological function and immunity, and exerts various pharmacological effects (Kiefer and Pantuso, 2003). Also, results in our study agree with Zhai *et al*. (2011a, b) who reported that administration of ginseng stem-leaf saponins in drinking water in chickens significantly enhanced the immune responses to vaccination against Newcastle disease.

Physical semen traits, testosterone hormone of Gimmizah cocks:

Results presented in Table (8) show the effect of supplemented either ginsenosides or ginseng on some physical semen traits and testosterone hormone of Gimmizah cocks. Results indicated that cocks fed 200 or 300 mg Gn /kg diet had significantly higher ejaculate volume (EJV), concentrate per ml (conc/ml), total sperm output/ejaculate (TSOPJ), mass motility (MMT), total motile

sperm/ejaculate (TMTSJ), sperm livability (SL), total live sperm/ejaculate (TLSJ), packet sperm volume (PSV) and testosterone (TSR) than those fed 100 or 200 mg GnD /kg diet. On the other hand, there were no significant effect among all treatments and control group in ABN and SPH. Furthermore, cocks fed 300 mg Gn /kg produced significantly highest TSOP, TMTS and TLS. On the other hand, there was no significant difference between groups supplied with 100 or 200 mg GnD /kg diet and control group in most of the previous traits except in the mass motility and testosterone level which was higher in 200 mg GnD/kg diet than 100 mg Gnd /kg and control group.

In conclusion, feeding cocks with ginseng 200 or 300 mg /kg diet and 300 mg ginsenosides /kg diet recorded a significant increased semen characteristics, plasma testosterone Our results are agree with those Hwang *et al*. (2010) which indicated that feeding ginseng improves the reduced feedback from the testes to the pituitary gland resulting in an increase in the amount of testosterone secreted from stimulates Leydig cells which may be degenerating and rejuvenation. Hong *et al*. (2002) showed that red ginseng plays an important role in enhancing the function of sex hormones necessary to testicular activities by enhancing the receptors of these hormones within the seminal tubules of the testicle. In addition to enhancing and increasing the production of proteins in testicular tissue, many recent studies have confirmed that ginseng plays an important role in increasing the number and motility of sperm, which increase fertility and thus increase male sexual effectiveness (Azazi *et al*., 2011). The present results also agree with those of Park *et al*. (2017) who indicated the role of ginseng in promoting sex hormone receptors and sexual activity for birds. The findings of this study are in agreement with Hong *et al*. (2002) who indicated that red ginseng has an important role in promoting the sex hormones necessary to perform the functions of the sexual organs by enhancing the receptors of these hormones.

Economical efficiency

Calculations were carried out according to the prices of feed ingredients, additives and eggs prevailing during year 2016 (the experimental time) as listed in Table (9). The economical efficiency values of laying hens were improved for the groups fed diets contained both of ginseng and ginsenosides as compared to the control during the studied laying period from 32 to 44 weeks of age. It may be due to the decreasing of feed consumption, the feed cost and increased egg production both of ginseng and ginsenosides as compared to the control.

GENERAL DISCUSSION

The results of the present study provide some evidence that under such conditions, somehow ginseng supplementation may be helped to yielding a better performance, perhaps attributed to the bioactive components, including saponins, antioxidants, peptides, polysaccharides, alkaloids, lignin, adaptogen and polyacetylenes and these results are in agreement with (Jo *et al*., 1995). Moreover, saponins, adaptogen and polysaccharides from ginseng could enhance immunity and perform a variety of functions, including immune modulation, antioxidant activities and improve health status(Zhang *et al*.,2009).Ginseng supplementation has been shown to increase energy, strengthen the immune

system, give a positive sense of well-being, and possibly. Because of all these proposed

positive effects, ginseng may be a very important supplement for improving performance of organs body. It has been proposed that ginseng may also play a significant role in nitric oxide production in the body. Nitric oxide plays an important role in immune system function, sexual health, muscular strength and hypertrophy, as well as other factors; ginseng may therefore be a vital form of the supplementation (Friedl *et al*. 2001).

CONCLUSION

Based on our results, supplementation of ginseng in the diet at (300 mg /kg diet) was more effective to get better productive and reproductive performance, immune response and semen quality of Gimmizah chickens were compared to both other levels of ginsenosides, ginseng and control group, in turn realizing best economic efficiency, are considered as a good management practice to increase the previous measurements. Further studies should be investigated in order to better understand and exploit its physiological role in humans and animals health.

Table(1): Ingredient and chemical composition (g/kg) of the experimental basal diet for Gimmizah chickens.

Ingredients	**%**
Yellow corn	66.33
Soybean meal (48%CP)	24.2
Limestone	7.5
Dicalcium phosphate	1.32
Vit+Min Premix[1]	0.25
NaCl	0.25
DL-methionine	0.15
Total	100
Calculated composition,%	
ME, kcal/Kg	2777
C/P ratio	163.6
Methionine, %	0.39
Methionine +Cystine,%	0.67
Lysine, %	0.8
Calcium, %	3.1
Phosphorus available, %	0.45
Values (AOAC, 2000) Analyzed	
Dry matter, %	90.73
Crude protein, %	16.97
Ether extrac, %	2.45
Crude fibre, %	3.96
Ash, %	6.37
Nitorgen free extract, %	60.98

[1]Vit+Min mixture provides per kilogram of diet: vitamin A, 12000 IU; vitamin E, 10 IU; menadione, 3 mg; Vit. D_3, 2200 ICU; riboflavin, 10 mg; Ca pantothenate, 10 mg; nicotinic acid, 20 mg; choline chloride, 500 mg; vitamin B_{12}, 10 μg; vitamin B_6, 1.5 mg; vitamin B_1, 2.2 mg; folic acid, 1 mg; biotin, 50 μg. Trace mineral (milligrams per kilogram of diet): Mn, 55; Zn, 50; Fe, 30; Cu, 10; Se, 0.10;Anti oxidant, 3 mg.

Table (2): Effect of dietary ginsenosides and ginseng on some productive and reproductive performance of Gimmizah laying hens.

Criteria	Control	GnD mg/kg diet			Gn mg/kg diet			SEM	P Value
		100	200	300	100	200	300		
Initial BW(32WK),g	1620	1615	1630	1615	1610	1615	1630	4.526	0.862
Final BW(44WK),g	1830	1855	1860	1885	1875	1885	1905	4.587	0.089
Change BW(32-44 WK),g	210	240	230	270	265	270	275	3.869	0.084
Egg production, %	56.88^{b}	59.36^{b}	60.32^{b}	60.87^{b}	60.51^{b}	63.67^{b}	74.44^{a}	1.128	0.0001
Egg weight, g	50.96^{c}	51.26^{bc}	51.71^{bc}	52.55^{ab}	52.37^{ab}	53.05^{a}	53.12^{a}	0.183	0.002
Egg mass, g/hen/d	30.75^{b}	30.85^{b}	31.20^{b}	31.89^{b}	31.34^{b}	32.64^{b}	39.57^{a}	0.638	0.001
Feed intake, g/hen/d	136.59^{a}	133.57^{a}	131.32^{a}	127.99^{ab}	130.12^{a}	127.25^{ab}	119.66^{b}	1.323	0.019
FCR, g feed/g egg mass	4.46^{a}	4.35^{a}	4.23^{a}	4.03^{a}	4.17^{a}	3.91^{a}	3.05^{b}	0.117	0.006
Fertility, %	85.00^{d}	91.67^{c}	92.50^{c}	95.83^{ab}	95.00^{b}	95.00^{b}	96.67^{a}	0.599	0.0001
Hatchability of fertile eggs, %	87.89^{e}	90.92^{d}	92.18^{d}	95.07^{bc}	93.86^{c}	95.90^{ab}	96.85^{a}	0.483	0.0001
Hatchability of total eggs, %	74.72^{f}	83.33^{e}	85.28^{d}	91.11^{b}	89.17^{c}	91.11^{b}	93.61^{a}	0.957	0.0001
Chick weight, g	37.00^{c}	37.33^{c}	38.00^{bc}	38.67^{b}	38.00^{bc}	38.67^{b}	40.00^{a}	0.198	0.0001

a, b ,c ; .Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$)
Control = fed basal diet without any supplementation.
GnD= ginsenosides Gn = ginseng
SEM = Standard error for means P Value= Probability level.

Table (3): Effect of dietary ginsenosides and ginseng on egg quality of Gimmizah laying hens.

Criteria	Control	GnD mg/kg diet			Gn mg/kg diet			SEM	P Value
		100	200	300	100	200	300		
Albumen weight %	57.5	57.70	58.11	57.15	56.94	56.64	57.17	0.147	0.139
Yolk weight %	31.23	31.38	31.60	31.90	31.81	32.07	32.16	0.122	0.329
Shell weight %	11.26^{a}	10.92^{ab}	10.29^{b}	10.95^{ab}	11.25^{a}	11.29^{a}	10.67^{ab}	0.088	0.019
Shape index	76.84	76.85	76.88	77.35	76.63	77.50	77.74	0.198	0.065
Yolk index	43.75	43.74	43.74	44.01	43.72	43.98	44.25	0.250	0.083
Shell thickness(mm)	0.404	0.407	0.410	0.412	0.414	0.415	0.417	0.003	0.071
Haugh unit score	90.98^{c}	92.40^{bc}	93.77^{abc}	95.51^{ab}	93.11^{abc}	96.61^{a}	96.70^{a}	0.479	0.006
Yolk color score	7.90	7.88	7.89	8.01	7.91	8.05	8.07	0.057	0.067
SA	49.29	49.24	49.37	49.45	49.41	49.46	49.88	0.150	0.139

a, b ,c ; .Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$)
Control = fed basal diet without any supplementation.
GnD= ginsenosides Gn = ginseng
SEM = Standard error for means P Value= Probability level SA: surface area

Table (4): Effect of dietary ginsenosides and ginseng on carcass characteristics of Gimmizah laying hens.

Criteria	Control	GnD mg/kg diet			Gn mg/kg diet			SEM	P Value
		100	200	300	100	200	300		
Carcass%	60.34^{b}	60.39^{b}	60.42^{b}	60.76^{b}	60.79^{b}	61.12^{b}	63.37^{a}	0.273	0.027
Gizzard%	1.352	1.355	1.399	1.510	1.412	1.519	1.565	0.365	0.169
Liver%	2.619	2.679	2.747	2.711	2.641	2.763	2.919	0.075	0.073
Heart%	0.472	0.503	0.511	0.511	0.523	0.528	0.546	0.016	0.084
Pancreas%	0.273	0.263	0.283	0.318	0.303	0.328	0.355	0.014	0.063
Spleen%	0.108^{b}	0.164^{b}	0.099^{b}	0.109^{b}	0.140^{b}	0.138^{b}	0.235^{a}	0.011	0.004
Intestinal weight %	6.548	6.565	6.548	6.753	6.612	6.830	7.065	0.222	0.059
Intestinal length (cm)	146.64	152.94	151.29	154.17	153.02	157.19	159.78	18.9	0.662
Ovary %	1.794^{c}	1.905^{bc}	2.079^{abc}	2.638^{ab}	2.629^{ab}	2.749^{a}	2.769^{a}	0.108	0.025
Number of large yellow follicle	2.47^{b}	2.40^{b}	2.48^{b}	2.78^{b}	2.55^{b}	2.96^{b}	4.93^{a}	0.20	0.04
Weight of yellow follicles%	1.233^{b}	1.549^{ab}	1.722^{ab}	2.038^{a}	2.014^{a}	2.200^{a}	2.258^{a}	0.999	0.047
Oviduct Weight %	2.253	2.347	2.508	2.627	2.618	2.765	2.799	0.083	0.540
Oviduct Length (cm)	33.15^{b}	36.29^{b}	35.08^{b}	40.50^{b}	35.74^{b}	43.95^{b}	55.17^{a}	3.49	0. 001
Abdominal fat %	4.348	4.314	4.290	3.781	4.086	3.351	3.361	0.234	0.829

a, b ,c ; .Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$)
Control = fed basal diet without any supplementation.
GnD= ginsenosides Gn = ginseng
SEM = Standard error for means P Value= Probability level.

Table (5): Effect of dietary ginsenosides and ginseng on some blood biochemical constituents of Gimmizah laying hens.

Criteria	Control	GnD mg/kg diet			Gn mg/kg diet			SEM	P value
		100	200	300	100	200	300		
AST U/L	57.0^{a}	53.0^{bc}	52.4^{bc}	42.7^{c}	49.5^{bc}	42.2^{c}	32.6^{d}	1.422	0.0001
ALT U/L	16.1^{a}	14.4^{b}	14.6^{b}	14.1^{b}	14.1^{b}	13.8^{b}	13.4^{b}	0.319	0.05
Total lipids (g/dl)	4.76^{c}	5.17^{bc}	5.15^{bc}	5.76^{abc}	6.37^{ab}	6.46^{ab}	7.12^{a}	0.202	0.008
Cholesterol (mg/dl)	150	145	152	143	144	150	146	1.380	0.54
LDL (mg/dl)	103	96	103	93	93	96	93	1.653	0.06
HDL (mg/dl)	33.6^{c}	36.8^{bc}	42.2^{b}	40.1^{b}	40.8^{b}	41.9^{b}	50.5^{a}	0.963	0.0001
HDL/LDL ratio	0.33^{c}	0.39^{bc}	0.39^{bc}	0.44^{b}	0.44^{b}	0.44^{b}	0.55^{a}	0.012	0.0001

a, b , c, d ; Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$)
Control = fed basal diet without any supplementation. GnD= ginsenosides Gn = ginsen SEM = Standard error for means P Value= Probability level.
(AST) Aspartate transaminase (ALT) Alanine transaminase, (LDL) low density lipoprotein (HDL) high density lipoprotein

Table (6) : Effect of dietary ginsenosides and ginseng on Serum antioxidant, lipid peroxidation and plasma female sex hormones (Estrogen and progesterone) of Gimmizah laying hens.

Criteria	Control	GnD mg/kg diet			Gn mg/kg diet			SEM	P value
		100	200	300	100	200	300		
TAC (mg/dl)	406^{b}	419^{b}	419^{b}	425^{b}	425^{b}	430^{b}	513^{a}	5.964	0.0001
MAD (mg/dl)	1.99^{a}	1.72^{ab}	1.68^{ab}	1.48^{bc}	1.82^{a}	1.76^{ab}	1.37^{c}	0.047	0.003
P_4 (ng/ml)	5.53^{b}	5.40^{c}	6.07^{ab}	6.37^{a}	5.70^{bc}	6.03^{ab}	6.17^{a}	0.069	0.0001
E_2 (ng/ml)	33.1^{a}	32.8^{ab}	33.1^{a}	31.9^{cd}	32.6^{ab}	30.7^{d}	31.5^{cd}	0.183	0.0001
E_2/P_4 ratio	6.04^{a}	5.91^{ab}	5.50^{c}	5.16^{c}	5.73^{ab}	5.10^{c}	5.11^{c}	0.08	0.0001

a, b , c, d ; Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$) Control = fed basal diet without any supplementation GnD= ginsenosides Gn = ginseng SEM = Standard error for means P Value= Probability level (TAC) total antioxidant capacity (MDA) malondialdehyd (E_2) estrogen (P_4) progesterone.

Table (7): Effect of ginsenosides and ginseng on immune responses indices of Gimmizah laying hens.

Criteria	Control	GnD mg/kg diet			Gn mg/kg diet			SEM	P value
		100	200	300	100	200	300		
PA (%)	22.3^{b}	23.0^{ab}	23.7^{ab}	24.7^{a}	24.0^{ab}	24.7^{a}	25.0^{a}	0.276	0.05
PI (%)	2.00^{b}	2.00^{b}	2.00^{b}	2.10^{b}	2.07^{b}	2.18^{a}	2.37^{a}	0.027	0.0001
IgG (mg/mL)	23.6^{d}	23.9^{d}	23.9^{d}	24.5^{bc}	24.3^{c}	24.6^{b}	25.1^{a}	0.081	0.0001
IgM (mg/mL)	9.60^{b}	9.84^{b}	9.91^{ab}	9.94^{ab}	9.91^{ab}	10.02^{a}	10.00^{a}	0.026	0.0001
HINDV (log)	3.33^{c}	3.67^{c}	4.67^{b}	4.67^{b}	5.00^{ab}	5.67^{a}	5.67^{a}	0.162	0.0001

a, b , c, d ; Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$) Control = fed basal diet without any supplementation.GnD= ginsenosides Gn = ginseng SEM = Standard error for means P Value= Probability level.

Phagocytic activity (PA) phagocytic index (PI)

Immunoglobulin G (IgG) Immunoglobulin M (IgM)

(HINDV) Haemagglutination inhibition of Newcastle disease virus.

Table (8): Effect of ginsenosides and ginseng on some physical semen traits of Gimmizah cocks.

Criteria	Control	GnD mg/kg diet			Gn mg/kg diet			SEM	P value
		100	200	300	100	200	300		
Ejaculate Volume (ml)	0.34^{c}	0.32^{c}	0.40^{c}	0.86^{ab}	0.72^{b}	0.90^{ab}	1.06^{a}	0.054	0.0001
Concentrate/ml($\times10^{9}$sperm)	1.69^{e}	1.96^{de}	2.34^{cde}	2.70^{bc}	2.52^{cd}	3.26^{ab}	3.81^{a}	0.139	0.0001
Total sperm output/ ejaculate ($\times10^{9}$sperm)	0.61^{d}	0.64^{d}	1.00^{d}	2.34^{bc}	1.77^{c}	2.92^{b}	4.01^{a}	0.217	0.0001
Mass motility (%)	77.6^{c}	77.6^{c}	85.0^{b}	91.2^{a}	90.0^{ab}	92.6^{a}	94.6^{a}	1.283	0.0001
Total motile sperm / ejaculate ($\times10^{9}$sperm)	0.49^{d}	0.50^{d}	0.86^{d}	2.14^{bc}	1.61^{c}	2.75^{b}	3.79^{a}	0.210	0.0001
Sperm livability (%)	78.2^{c}	78.6^{c}	82.8^{c}	92.0^{ab}	88.2^{b}	92.6^{ab}	95.8^{a}	1.241	0.0001
Total live sperm/ ejaculate ($\times10^{9}$sperm)	0.49^{d}	0.51^{d}	0.84^{d}	2.16^{bc}	1.564^{c}	2.711^{b}	3.839^{a}	0.212	0.0001
Abnormality (%)	11.6	11.8	11	10.4	11	10.6	9.8	0.120	0.55
Packet sperm volume (%)	6.23^{e}	7.27^{de}	8.68^{cde}	10.00^{bc}	9.33^{cd}	12.05^{ab}	14.11^{a}	0.514	0.0001
Semen PH value	7.27	7.3	7.25	7.28	7.26	7.27	7.24	0.016	0.98
Testosterone (ng/ml)	2.89^{d}	2.85^{d}	3.46^{c}	4.48^{ab}	4.42^{b}	4.47^{ab}	4.56^{a}	0.125	0.0001

a, b , c, d ; Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$) Control = fed basal diet without any supplementation.

GnD= ginsenosides Gn = ginseng

SEM = Standard error for means P Value= Probability level.

Table (9): Effect of ginsenosides and ginseng on economical efficiency of Gimmizah laying hens during 32-44 weeks of age.

Parameters	Control	GnD mg/kg diet			Gn mg/kg diet		
		100	200	300	100	200	300
Average feed consumption kg per hen during 32-44 weeks of age	11.47	11.22	11.03	10.75	10.93	10.69	10.05
Cost /kg feed, L.E[1]	3.9	3.96	4.02	4.08	3.945	3.99	4.035
Total feed cost, L.E[2]	44.73	44.43	44.34	43.86	43.12	42.65	40.55
Number of egg produced / hen	47.78	49.86	50.67	51.13	50.83	53.48	62.53
Price of one egg, L.E[3]	1	1	1	1	1	1	1
Total return / hen, LE	47.78	49.86	50.67	51.13	50.83	53.48	62.53
Net return / hen, LE[4]	3.05	5.43	6.33	6.27	7.71	10.83	21.98
Economic efficiency[5]	6.81	12.22	14.28	14.30	17.88	25.39	54.20

Control = fed basal diet without any supplementation.

GnD= ginsenosides Gn = ginseng

1-Price of Kg diet (assuming that 1 Kg unsupplied diet =3.90 LE, 1 Kg ginseng=450 LE and 1 Kg ginsenosides=600 LE). L.E = Egyptian pound.

2- According to price of different ingredients available in Egypt at the experimental time.

3- According to local price at the experimental time. Egg Market Price= 1 LE

4-Net Revenue (LE) = Differences between Egg market price and Feed cost.

5-Economic efficiency = (Net return LE / Total feed cost LE) x100

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الملخص العربى

تأثير إضافة الجنسينوسيد و الجنسينج على الاداء الانتاجى و التناسلى فى دجاج الجميزة 2- خلال مرحلة الانتاج

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أجريت هذه الدراسة لمعرفة مدى تاثيرإضافة الجنسينوسيد و الجنسينج فى علائق الدجاج البياض على تحسين أداء دجاجات و ديوك الجميزة و بعض الصفات الفسيولوجية و المناعية ، استخدم فى هذه الدراسة عدد 210 طائر (189 دجاجة و 21 ديك)عمر 32 أسبوع من سلالة الجميزة. تم وزن الطيور فردياً و قسمت عشوائياً إلى سبع مجموعات كل مجموعة تتكون من ثلاث مكررات (عدد 10/عشة) فى عنبر يعمل بالنظام المفتوح (عدد 1 ديك / 9 فرخات) حتى نهاية التجربة عند 44 أسبوع. استخدمت المجموعة الأولى كمجموعة مقارنة (كنترول) و تم تغذيتها على العليقة الأساسية بدون إضافات و المجموعة الثانية و الثالثة و الرابعة تمت تغذيتها على العليقة الأساسية مضاف إليها الجنسينوسيد بمعدل 300 , 200 , 100 ملجرام / كجم علف على الترتيب أما المجموعة الخامسة و السادسة و السابعة فتم تغذيتها على العليقة الاساسية مضافاً إليها الجنسينج بمعدل 300 , 200 , 100 ملجرام / كجم علف على الترتيب ، أوضحت نتائج التجربة أن الدجاج المغذى على 300 ملجرام جينسينج لكل كيلو جرام علف أعطى أفضل نتائج لصفات انتاج البيض % و كتلة البيض و الكفائة التحويلية للعلف و نسبتى الخصوبة والتفريخ مقارنة بالمجاميع الأخرى.كان للاضافات الغذائية المختلفة للعليقة الأساسية تاثيرا معنويا على تحسين مضادات الأكسدة و كفاءة الكبد وصور الدهن فى الدم مقارنة بالكنترول، كما وجد ان لها تاثيرا معنويا على زيادة هرمون الاستروجين مقارنة بالكنترول.

وقد خلصت الدراسة الى ان اضافة 300 ملجرام جينسينج لكل كيلو جرام علف يؤدى إلى تحسن فى الصفات الانتاجية و التناسلية و المناعية خلال مرحلة الانتاج لدجاج الجميزة البياض فضلا عن الكفاءة الاقتصادية .