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EFFECTS OF GINGER AND BEE PROPOLIS ON THE PERFORMANCE, CARCASS CHARACTERISTICS AND BLOOD CONSTITUENTS OF GROWING JAPANESE QUAIL

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A B S T R A C T : This study was conducted to investigate the effect of supplementing ginger and bee propolis as a growth promoter and antioxidant material on performance traits, carcass characteristics, blood parameters and antioxidant status of growing Japanese quail. A total of one hundred and thirty-five, 7 days old unsexed growing Japanese quails were randomly divided into 5 groups, each 3 replication of 9 birds per replicate in a complete randomized design. Five diets were formulated as follows: the1st diet was basal diet without supplement and served as negative control and the 2nd diet was basal diet supplemented with 100 mg/kg antibiotic and served as positive control, while the 3rd and 4th diets included 125 mg/kg ginger and 500 mg/kg bee propolis, respectively and the 5th diet included a mixture of 125 mg ginger + 500 mg bee propolis/ kg diet. The results showed that dietary supplementations did not significantly ($P\leq0.05$) influence the final live weight and weight gain. Significant ($P\leq0.05$) decrease in feed intake was recorded in the group received antibiotic and 500 mg propolis in their diet as compared to the control. Quails received 500 mg propolis in their diet had the best ($P\leq0.05$) record of feed conversion ratio. This group surpassed the control one by 4.2 %. The highest value of relative carcass weights was obtained in the group received 500 mg propolis/kg diet. Numerical decrease was observed in relative weight of abdominal fat and numerical increase was observed in lymphoid organs in all groups fed the different supplementations. Antibody titters against avian Newcastle disease significantly improved by different treatments at 21 days after vaccination. Serum total lipids, triglycerides and total cholesterol were significantly decreased for groups fed on different feed additives as compared to negative control group. Significant increase in HDL concentration was recorded in the groups given ginger or propolis contained diets as compared to the control groups. Dietary treatments significantly increased total antioxidant capacity and glutathione peroxidase activity and significantly decreased Malondialdehyde compared to the negative control. In conclusion, the results indicated that growing Japanese quail fed diet supplemented with ginger, propolis or its combination could effectively be added to quail ration to improve feed conversion ratio and humeral immunity and optimize lipid profile in blood serum and enhance anti-oxidative status.

Key Words: Quail, Ginger, Bee propolis, Performance, Carcass, Blood constituents.

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INTRODUCTION

Antibiotics are microbial metabolites produced by fungi and algae which have low molecule weight and can inhibit the growth of other microorganisms even in low concentrations (Nir and Ve-Senkoylu, 2000). While antibiotics have prevalently been used as growth promoters in animal nutrition, European Community has prohibited the use of antibiotics in animal nutrition as growth promoters from January 1, 2006. As a result of that, demands on alternative products have started. Consequently, studies on natural products such as plant extracts have recently gain a great attention (Wenk, 2000). It is stated that the phytoplankton can continuously be used in rations without any need for their removal and that they do not induce any resistance to antibiotics (Gill, 1999). At present, phytogenic products can be classified as sweeteners and appetizers without a requirement for the determination of their minimum residue levels (Kamel, 2002). On the other hand, there is misbelieve that "all plant extracts are beneficial since they are natural and organic". For example, the plant "EPHEDRA" was prohibited at the end of the year 2003 since it damages nervous system and leads psychosis, memory loss and even death. Animals, poultry in particular, are very sensitive to pathogenic bacteria such as *E. coli*, *Salmonella sp. Clostridium perfringens and Campylobacter sputorum*. The pathogenic microbial flora in the small intestine compete with host for nutrients while at the same time inhibiting the binding of the bile acids to the pertinent substances, they decrease the digestion of fats and fat-soluble vitamins. This leads to a decrease in performance and increase in disease rate. Antibiotics, which have been used as growth promoters in poultry feed for a long time, improve the growth performance by stabilizing the microbial flora in the intestine and preventing some specific intestine pathogens (Gunal *et al.,* 2006). Another increasingly important recent natural product is propolis. It is a glue-like substance that honey bees collect from plant seedlings and buds. It is obtained as a result of the biochemical alteration of the resinous materials and plant secretions by the enyzmes secreted from the glands of the bees. It has a color ranging from dirty yellow to dark brown, a strong and nice odor, is water-insoluble and semi-solid in room temperature (Hepsen *et al.*, 1996; Sahinler, 2000). The composition of raw propolis is generally composed of 50% resin and vegetal balsam, 30% bees wax, 10% essential and aromatic oils, 5% pollen and 5% other organic substances (Kumova *et al.*, 2002; Dodologlu *et al.*, 2003; Silici, 2003).

Ginger (*Zingiber Officinale*) is widely used in many countries as a food condiment and as a medicinal herb (Chrubasik *et al.*, 2005). The main important compounds in Ginger are gingerol, gingerdioland gingerdione which have the ability to stimulate digestive enzymes, affect the microbial activity and having antioxidative activity (Dieumou *et al.*, 2009). When used in broiler diets, ginger supplementation improved antioxidant and broiler chickens blood serum (Zhang *et al.*, 2009). Ginger and propolis which could be considered as alternatives to antibiotics have a wide range of potential uses. Therefore, the determinations of the effects of these products on human and animal health are of significant importance at present due to the relation with safe nutrient production. Therefore, the objective of the present study was to determine the effect of propolis and ginger either as separate or in combination and their associated effects on growing Japanese quail performance, carcass traits, blood constituents, antioxidant status and immune response.

MATERIALS AND METHODS

The present study was carried out at the Poultry Research Laboratory, Department of Animal and Fish Production, Faculty of Agriculture (Saba Basha), Alexandria University, Egypt. One hundred and thirty-five, 7 days old unsexed growing Japanese quail chicks were randomly divided into 5 groups with 27 chicks in each group and each group was allotted into 3 replicates (9 each) in a complete randomized design. Five diets were formulated as follows: the1st diet was basal diet without supplement and served as negative control and the 2nd diet was basal diet supplemented with 100 mg/kg antibiotic and served as positive control, while the 3rd and 4th diets included 125 mg/kg ginger and 500 mg/kg bee propolis, respectively and the 5th diet included a mixture of 125 mg ginger + 500 mg bee propolis/ kg diet. The basal diet was formulated to meet the birds dietary nutrient requirements (NRC, 1994). The composition and chemical analyses of the basal diet is shown in Table 1. It contained 24 % crude protein and 2900 Kcal ME/ Kg. Propolis obtained as powder from Egyptian market (HNBOOMBP-01, Code: 410004900, Henan Boom, China), also the ginger obtained from the local market. All quails were reared in wire batteries under the same managerial, hygienic and environmental conditions. Feed and water were available *ad libitum*. The house temperature was kept at about 35°C during the first 3 days, then gradually decreased by 2 °C weekly until reached 24° C and kept constant until the end of the experiment. All birds were subjected to 23 hours light at intensity of 3 watt/m^2 along the experimental period lasted for 28 days. Live body weight, and weight gain and feed consumption of quails were recorded weekly. Feed conversion ratio was calculated (g feed / g gain). Six birds were randomly selected per treatment and fasted for 12h before slaughtering to determine the carcass traits. Chick organs such as heart, liver, gizzard, abdominal fat and the lymphoid organs (thymus, spleen, pancreas and bursa) were weighed individually and expressed as percentage of slaughtered weight. Blood samples from the brachial vein of 4 birds in each treatment were drawn and serum were obtained by centrifugation of blood at 3500 r.p.m. for 15 min. and kept at –18 ºC until analyzed. Serum total lipids, triglycerides, total cholesterol, low density lipoprotein (LDL), high density lipoprotein (HDL), Malondialdehyde (MDA), total antioxidant capacity and glutathione peroxidase activity were calorimetrically determined using commercial kits (Biomerieux, Poains, France). In a separate experiment, 40 unsexed growing quails, 7 days old were randomly divided into 5 groups with 8 quails in each group. All quails reared under the same experimental conditions in a separate building and fed the same experimental diets as shown previously for 42 day of age. On day 21 of age, 4 quails were randomly selected from each group and vaccinated with live-vaccine (HIB) via eye drop. After 14 and 21 of vaccination, quails from each group were bled via wing vein puncture using sterilized needle. The separated sera by centrifugation (4000 rpm, 15 min) were used to assess the systemic antibody titer response to Newcastle disease virus (NDV). Antibodies to Newcastle Disease (ND) antigen in blood sera were measured by haemagglutination inhibition (HI) test as described by (Brown *et al.* 1990). Serial two fold dilutions of serum in 0.25ml amounts were prepared, equal amounts (0.25ml) of Newcastle disease virus (NDV) suspension containing 4 hemaglutinating (HA) units were then added to the serum dilutions. After mixing, the plates were left at room temperature for 10-15 minutes and then 0.25rnl amounts of l% suspension of washed chicken red blood cells in saline was added. The plates were allowed to stand for 30 minutes at room temperature after which a serum titer was recorded as the highest serum dilution giving 50% inhibition. Suitable serum, virus and red cell controls were included. The titers were transformed to log 2 units and the log geometric mean (GM) of titers of a group of sera was calculated as following the method of Brown *et al.* (1990) to allow comparison.

Statistical analysis: Data were analyzed by one-way analysis of variance according to SAS (2004) and significant differences among means were detected by the Duncan’s Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Results presented in Table (2) indicate that there were no significant differences in initial body weight among different treatments due to the random distribution of the experimental birds among treatments.

Dietary supplementations did not significantly ($P \leq 0.05$) influence the final live body weight and weight gain. This observation agreed with the results of El-Deek *et al.* (2002) who found that there were no significant differences in body weight by using 0.05 or 0.1 % of ginger powder in broiler diets. Also, there was not improvement in body weight of broiler chicks fed 2% of dried ginger rhizomes supplement when compared to the chicks fed the control diet (Thayalini *et al.*, 2011). Recently, Fakhim *et al.* (2013) found that body weight gain of the chickens was not significantly different among the birds fed diets contained ginger supplements and control. Also, Silici *et al.* (2007) reported that propolis had no detrimental effect on the health but did not improve the performance parameters of quail in the first 35 days of age. Mahmoud *et al.* (2013) observed that addition of 100, 250, 500 and 750 mg/kg propolis did not improve broiler performance. Kleczek *et al.* (2014) found that the final body weight of broiler chickens during the rearing period did not significantly differ between groups given diets contained antibiotic, propolis and control diets. Contrary to all these studies, there are positive effects of ginger plant extracts and/or propolis on live body weight gain (Hernandez *et al.,* 2004; Roodsari *et al.*, 2004; Shalmany and Shivazad, 2006). Supplementing diet with ginger meal resulted in a better growth performance, as shown by the improvement in body weight of broiler chicks (Ademola *et al.,* 2009; Zhang *et al.,* 2009). On the other hand, Santos *et al.* (2003) reported that propolis decreased live body weight gain of growing broilers during 42 days. Acikgos *et al.* (2005) indicated that supplementation of male broiler chicks with 4000 ppm propolis significantly decreased body weight. Moreover, Koya-Miyata *et al.* (2009) recorded that administration of 50 mg/kg propolis extract orally in mice significantly reduced the weight gain.

The results in Table (2) showed a significant ($P \leq 0.05$) decrease in feed intake for groups received antibiotic and 500 mg propolis in their diet as compared with the control group. The decrease in these groups reached to 2.1 and 3.4 %, respectively. The lowest value in feed intake was recorded in the group given 500 mg propolis in their diet as compared with the other experimental groups. Mahmoud *et al.* (2013) who found insignificant reduction in feed intake in propolis treated groups. Kleczek *et al.* (2014) found that the feed intake (kg) per kg body weight of broiler chickens was not significantly different between the groups given diets contained antibiotic, propolis or control diets during the rearing period. Also, the finding of Acikgoz *et al.* (2005) and Canogullari *et al.* (2009) indicated that the dietary supplementation with propolis had no significant effect on average daily feed consumption when compared with the control group. While, Silici *et al.* (2007) reported that, propolis had no detrimental effect on the health but did not improve the performance parameters of quails in first 35 days. Controversially, It was observed that feed intake was significantly increased when quails fed on propolis (Denli *et al.*, 2004), and broilers (Biavatti, *et al.*, 2003; Ziaran *et al.*, 2005; Shalmany and Shivazad, 2006; Hassan and Abdulla, 2011 and Daneshmand *et al.*, 2012). Concerning ginger, Barazesh *et al.* (2013) when fed Ross chicks on diets contained different levels of ginger powder (0, 0.5, 1 and 1.5 %), observed that increasing levels of dietary ginger powder caused a significant reduction in feed intake, and the lowest feed intake and the best feed conversion ratio values were recorded in the group fed 1 % ginger powder as compared to the control and the other experimental groups.

Significant ($P \leq 0.05$) differences among different treatments and control group were found in feed conversion ratio. The birds received 500 mg propolis in their diet had the best record of feed conversion ratio. This group surpassed the control one by 4.2 %. The other experimental groups showed insignificant effect in feed conversion ratio in comparison with the control group. Generally, the decrease in feed intake and improvement in feed conversion ratio may be due to the presence of phenolis and flavonoids ofpropolis supplementation which could be attributed to their antimicrobial, antioxidant activity and improving nutrient utilization (Tatli Seven *et al.*, 2009). Haro *et al.* (2000) mentioned that propolis improved feed conversion ratio which depended on the fact that digestive functions are favored by this dietary supplement.

The effect of treatments on digestibility coefficients of nutrients is shown in Table (3). The different supplementations had insignificant effect on digestibility of crude protein, ether extract, crude fiber, organic matter and nitrogen free extract. Most of feed additives used in the present study showed insignificant improvement in digestibility coefficients of most nutrients as compared to those of the control groups. Synergistic effect due to the combination of propolis and ginger powders did not give any advantage over that presented with each of propolis or ginger alone. Ginger has been shown to contain a high level of plant proteolytic enzyme (Thompson *et al.*, 1973; Ziauddin *et al.*, 1995) that could help birds digest dietary protein upon ingestion. Also Rao *et al.* (2003) found that ginger enhanced the activity of pancreatic chymotrypsin and amylase. They reported also that the positive influence on the activity of enzymes may have a supplementary role in the overall digestive stimulant action of ginger, besides causing an enhancement of titres of digestive enzymes in pancreatic tissue. Incharoen and Yamauchi (2009) found that the rhizome of ginger can stimulate digestive juices such as bile, salivary, gastric, pancreatic and intestinal secretions. Acikgos *et al.* (2005) reported that dry matter and organic matter digestibilities did not change in both starter and grower diets supplemented by propolis of broilers, whereas propolis supplementation to the starter diet improved the digestibility of ether extract ($P \leq 0.05$). However, consuming propolis for the first three weeks had adverse effect on crude protein digestibility of broilers in the subsequent three weeks ($P \leq 0.05$). Also, da Silva *et al.* (2014) reported that lambs given propolis in their diet did not affect dry matter, organic matter, crude protein digestibility, but crude propolis supplementation provided higher ether extract digestibility than monensin sodium.

Supplementation of different feed additives to Japanese quail diets significantly (P≤0.05) affected the relative carcass weight (Table 4). The highest value of relative carcass weight was obtained from the group received 500 mg propolis/kg diet. This group surpassed the control by 3.3 % with insignificant differences as compared to the control group. However, the lowest value was recorded in the group fed a mixture of ginger and propolis with insignificant differences among these groups. Anitibiotic and ginger supplementation gave an equal effect to the control group. A mixture of ginger and propolis recorded a significant (P≤0.05) less relative carcass weight than propolis inclusion. The different supplementations did not significantly affect the relative weight of liver, heart, gizzard and pancreas. However, numerical decrease was observed in relative weight of abdominal fat in all groups fed the different supplementations. The lowest value in abdominal fat content was recorded by birds received antibiotic, followed by mixture of ginger and propolis, respectively. Kleczek *et al.* (2014) reported that the broiler chickens carcass weight did not differ significantly between broilers groups fed diets contained antibiotic, propolis or control group. Coloni *et al.* (2006) showed that propolis extract (0, 0.8 and1.5 ml) did not affect (P>0.05) carcass edible organs relative weights of growing NZW rabbits slaughtered at 84 d of age, and carcass and inner organs weights of broiler chicks (Tekeli *et al.*, 2011).

It is clear as presented in Table (5) that the relative weight of bursa of fabricious was increased in birds fed diets contained 500 mg propolis as compared to the control and the other experimental groups. Most of the experimental feed additives showed an increase in relative weight of thymus and spleen as compared with the control group. The increase in lymphoid organs weight may be an adaptive response to feed additives administration. Results in Table (5) showed that using different feed additives in the present study had insignificant increase in antibody titters against NDV at 14 days after vaccination. While, at 21 days after vaccination, antibody titters against NDV were significantly increased in all treated groups compared to the control groups. The mixture of ginger and porpolis was superior in antibody titters against NDV at 21 days after vaccination followed by propolis treatment then ginger treatment, respectively.

The increase in lymphoid organs weight may be connected to the effect of feed additives on lymphatic organs activities. The impact of these feed additives as an immune-stimulant in quail could be attributed to several possibilities: an enhancement of lymphocyte activation or proliferation, or an increased life time span of the lymphocytes, or a combination of these mechanisms. Therefore, it could be assumed that the enhancement of the humeral immunity in the present study could be related to the elevation of the lymphatic organs activities. Consequently, it could be recommended that modulation of the immune status of young quail may produce beneficial effects and provide a new avenue in improving poultry production.

The effect of different feed additives on meat quality index such as water holding capacity (WHC), pH, color, tenderness and its chemical composition (dry matter, crude protein, ether extract and ash) were not significantly affected by different treatments as compared to the control group (Table 6).

Results Table (7) showed that most of different supplementations induced a significant (P≤0.05) decrease in serum total cholesterol, total lipids and triglycerides for groups fed on different feed additives as compared to quails fed negative control diet. Significant (P≤0.05) increase in HDL concentration was recorded in the groups given ginger or propolis contained diets as compared to quails fed control diets. Significant decrease in LDL concentration was recorded in the groups given ginger, ropolis or their combination in diets compared to negative control group. The decrease in triglycerides and cholesterol may be attributed to propolis that plays a major role as antioxidant material which increased glutathione enzyme activity. Propolis contains some components such as essential fatty acids which inhibit hepatic 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CO A) reductase activity (Crowell, 1999) which is a key regulatory enzyme in cholesterol synthesis. These results are in agreement with those obtained by Babaei *et al.* (2004) who reported that Japanese quail fed diet contained 1000 ppm alcoholic extract of propolis significantly (P≤0.05) lowered total cholesterol, triglycerides and LDL and increased level of HDL in the blood as compared with quail fed control diet. It was expressed in the findings of diverse studies that propolis intake lead to a decrease in the level of plasma triglycerides concentration (Fuliang *et al.,* 2005). This lowering effect can be attributed to the regulatory mechanism of the flavanoids as one of the ingredients in these natural products for blood circulation and stimulation of triglycerids use for energy generation (Tekeli *et al.,* 2011). On the other hand, Daneshmand *et al.* (2015) reported that propolis supplementation in broiler chicks diet resulted in insignificant differences with regard to serum lipid profile as compared with control. Regarding to ginger, Onu and Aja (2011) reported that the hypocholesterolemic effect of ginger could have possibly resulted from the inhibition of cellular cholesterol biosynthesis. The adding ginger rhizome powder to the food could be useful in the management of cardiovascular disease in which atherosclerosis is the most important factor may be due to the presence polyphenolis and flavonoids may prevent coronary artery disease by reducing plasma cholesterol level or by inhibiting LDL oxidation, a process which is through to play a key role in the pathogenesis of atherosclerosis (Bordia *et al.,* 1997; Fuhrman *et al.,* 2000; Nicoll and Henein, 2009).

The different dietary treatments significantly (P≤0.05) increased total antioxidant capacity and glutathione peroxidase activity and significantly (P≤0.05) decreased MDA compared to the negative control group (Table 8). This increase of total antioxidant capacity and glutathione peroxidase in serum indicated that all feed additives used in the present study improved the antioxidant status in growing Japanese quail. The best values of total antioxidant capacity were recorded in the group received the mixture of ginger and propolis followed by groups received 500 mg propolis, ginger 125 mg/kg and 100 mg antibiotic, respectively. Malondialdehyde as an indicator of lipid peroxidation and oxidative stress was significantly decreased in all treatments compared to the negative control. Flavonoids from propolis have been reported to elevate glutathione peroxidase, catalase, superoxide dismutase and mRNA synthesis by increasing the activities of antioxidant enzymes, also flavonoids from propolis reduce the number of free radicals or ROS generated and increase the production of molecules protecting against oxidative stress (Jeon *et al.,* 2002). Propolis and its polyphenolic and flavonoid components increased the activities of glutathione peroxidase, superoxide dismutase, catalase, glutathione reductase and glutathione (Molina *et al.,* 2003; Orsolic and Basic, 2005). Several flavonoids have been reported to protect against DNA damage (Russo *et al.,* 2000).

Ginger has been defined as an important component of an antioxidant network that prevents membrane damage from oxidation (Hui, 1996 and Akhani *et al.*, 2004).

CONCLUSION

Bee propolis, ginger or their mixture could effectively be used as a growth promoter and natural antioxidant in growing Japanese quail diets for improving feed conversion ratio, humeral immunity and to optimize lipid profile in blood serum and enhance anti-oxidative status without negative effects on birds viability.

Table (1): Composition and chemical analysis of the basal experimental diets

Ingredients	**%**
Yellow corn	53.30
Soybean meal (44 %)	33.00
Concentrate (50 %) *	10.00
Di-calcium phosphate	0.20
Limestone	1.70
Sunflower oil	0.80
Vit. and min. mix.**	0.50
Salt (NaCl)	0.50
Total	100
Calculated analyses[1]:	
Crude protein, %	24.05
ME (Kcal/ Kg diet)	2907.10
Ether extract, %	2.44
Crude fiber, %	3.63
Methionine, %	0.76
Methionine + cysteine, %	0.88
Lysine, %	1.42
Calcium, %	1.11
Av. phosphorus	0.39

***** Concentrate : ME (K cal/kg) 2870, Crude protein 50%, Crude fiber 1.51%, Crude fat 54.1% Calcium 29.4%, Phosphorus 39.2%, NaCl8.0%, Methionine 6.4%, Methionine &Cysteine38.5%, Lysine 90.3%.

** Each kg of vitamin and minerals mixture contained: Vit. A, 4,000,000 IU; Vit. D_3, 500,000 IU; Vit, E, 16.7 g., Vit. K, 0.67 g., Vit. B1, 0.67 g., Vit. B2, 2 g., Vit. B 6, .67 g., Vit. B12, 0.004 g., Nicotinicacid, 16.7 g., Pantothenicacid, 6.67 g., Biotin, 0.07 g., Folicacid, 1.67 g., Choline chloride, 400 g., Zn, 23.3 g., Mn, 10 g., Fe, 25 g., Cu,1.67 g., I, 0.25 g.,Se, 0.033 g. and,Mg, 133.4 g.

[1] According to NRC (1994).

Table (2): Effect of ginger, bee propolis and their mixture on productive performance of growing Japanese quail.

Treatments	Initial body weight (g)	Final body weight (g)	Weight gain (g)	Feed intake (g)	Feed conversion ratio
Negative control	30.02±0.46	225.43±3.08	195.41±3.07	464.66±2.53^{a}	2.38±0.01^{ab}
Positive control	30.0±0.46	227.64±3.81	197.56±3.73	454.82±3.29^{bc}	2.30±0.03^{bc}
125 mg ginger (G)	30.03±0.47	221.58±2.59	191.55±2.51	458.53±2.70^{abc}	2.39±0.02^{a}
500 mg propolis (P)	30.01±0.44	227.44±3.63	197.43±3.49	449.32±2.46^{c}	2.28±0.02^{c}
Combination of G + P	29.99±0.45	222.14±3.18	197.42±3.09	457.67±2.50^{abc}	2.32±0.02^{abc}

a - c: different superscripts within a column indicate significant differences ($P \leq 0.05$).

Table (3): Effect of ginger, bee propolis and their mixture on digestibility coefficients of nutrients of growing Japanese quail.

Treatments	Crude protein %	Ether extract %	Crude Fiber %	Nitrogen free extract %	Organic matter %
Negative control	82.93±0.68	80.85±0.76	13.17±3.44	74.59±1.01	73.99±1.03
Positive control	84.12±0.57	82.18±0.64	19.22±2.92	76.36±0.85	75.80±0.87
125 mg ginger (G)	84.77±2.93	82.91±3.29	22.51±14.90	77.32±4.36	76.79±4.46
500 mg propolis (P)	85.33±0.84	83.55±0.95	25.38±4.29	78.16±1.26	77.65±1.29
Combination of G + P	83.84±0.34	81.88±0.38	17.82±1.74	75.95±0.51	75.38±0.52

Table (4): Effect of ginger, bee propolis and their mixture on carcass traits of growing Japanese quail.

Treatments	Carcass %	Liver%	Heart %	Gizzard %	Pancreas %	Abdominal fat %
Negative control	65.94±0.24^{ab}	2.12±0.28	0.81±0.04	1.78±0.11	0.22±0.04	0.97±0.09
Positive control	65.12±0.97^{abc}	2.49±0.39	0.88±0.10	1.83±0.10	0.21±0.03	0.54±0.16
125 mg ginger (G)	65.62±0.89^{abc}	1.82±0.24	0.86±0.04	1.82±0.04	0.15±0.02	0.87±0.22
500 mg propolis (P)	68.17±1.72^{a}	2.37±0.33	0.82±0.12	2.01±0.24	0.22±0.05	0.66±0.14
Combination of G + P	64.65±0.36^{bc}	1.82±0.07	0.79±0.05	1.85±0.18	0.16±0.02	0.63±0.09

a - c: different superscripts within a column indicate significant differences ($P \leq 0.05$).

Table (5): Effect of ginger, bee propolis and their mixture on lymphoid organs and humeral immunity of growing Japanese quail.

Treatments	Bursa of fabricious, %	Thymos, %	Spleen, %	Humeral immunity	
				at 14 day	at 21 day
Negative control	0.93±0.01	0.101±0.01	0.036±0.00	1.00±0.00	2.0±0.00 [d]
Positive control	0.101±0.02	0.136±0.02	0.055±0.01	1.00±0.00	2.0±0.00 [d]
125 mg ginger (G)	0.92±0.00	0.137±0.03	0.053±0.01	1.33±0.67	2.50±0.03 [c]
500 mg propolis (P)	0.141±0.02	0.117±0.01	0.045±0.01	1.67±0.33	3.50±0.13 [b]
Combination of G + P	0.094±0.02	0.182±0.01	0.047±0.01	1.33±0.33	4.50±0.00 [a]

Table (6): Effect of ginger, bee propolis and their mixture on chemical analyses of meat and physical characteristics of meat at 5 weeks of age

Treatments	Chemical analyses of meat, %				Meat physical characteristics			
	Dry matter	Protein	Fat	Ash	pH	Color	WHC	Tenderness
Negative control	28.81±0.21	21.75±0.26	3.20±0.10	3.39±0.39	6.76±0.17	0.38±0.17	9.33±1.59	6.01±1.59
Positive control	29.84±0.21	22.40±0.27	3.35±0.13	3.65±0.07	7.17±0.12	0.24±0.04	9.71±0.05	5.72±0.54
125 mg ginger (G)	29.39±0.56	21.86±0.26	3.45±0.11	3.62±0.55	6.57±0.20	0.23±0.04	10.73±0.17	7.42±0.37
500 mg propolis (P)	28.34±0.43	21.74±0.34	2.90±0.11	3.21±0.23	6.57±0.02	0.23±0.02	9.22±0.40	5.49±0.30
Combination of G + P	28.52±0.30	21.65±0.16	3.39±0.08	3.02±0.47	6.90±0.32	0.23±0.01	9.28±1.15	5.14±1.25

Table (7): Effect of ginger, bee propolis and their mixture on blood serum lipid profile

Treatments	Total lipids (mg/dl)	Triglycerides (mg/dI)	Cholesterol (mg/dI)	HDL /(mg/dI)	LDL (mg/dI)
Negative control	1011.50±40.23^{a}	467.50±1.85^{a}	259.50±19.85^{a}	19.75±0.25^{b}	165.45±19.12^{a}
Positive control	668.50±6.80^{e}	232.50±1.89^{d}	205.50±2.90^{b}	17.75±0.48^{b}	141.25±2.66^{ab}
125 mg ginger (G)	683.50±10.07^{de}	220.50±4.29^{d}	219.00±2.92^{b}	25.00±0.71^{a}	135.25±1.89^{b}
500 mg propolis (P)	792.50±17.73^{c}	340.00±20.41^{c}	213.75±2.78^{b}	23.25±0.48^{a}	122.50±6.61^{b}
Combination of G + P	855.75±12.34^{b}	424.75±2.21^{b}	191.00±5.21^{c}	24.00±1.58^{a}	110.00±3.49^{c}

a - d: different superscripts within a column indicate significant differences ($P \leq 0.05$).

Table (8): Effect of ginger, bee propolis and their mixture on serum antioxidative Status in Japanese quail

Treatments	Total antioxidant capacity(mm/L)	Glutathione peroxidase(mu/ml)	Malondialdehyde (nmol/ml)
Negative control	0.66±0.02[c]	15.55±0.47[b]	14.89±0.33[a]
Positive control	1.38±0.06[a]	29.44±0.38[a]	11.64±0.23[b]
125 mg ginger (G)	1.38±0.06[a]	28.40±0.26[a]	11.22±0.02[b]
500 mg propolis (P)	1.42±0.13[a]	27.95±0.11[a]	9.62±0.10[c]
Combination of G + P	1.45±0.02[a]	28.76±0.40[a]	9.04±0.25[c]

a - d: different superscripts within a column indicate significant differences ($P \leq 0.05$).

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الملخص العربى

تأثير إضافه الزنجبيل وبروبوليس نحل العسل علي الأداء الإنتاجي وصفات الذبيحه ومكونات الدم للسمان الياباني

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أستخدم في هذه التجربه ١٣٥ طائر سمان نامى عمر ٧ ايام غير مجنس وتم تقسيمهم عشوائيا على ٥ معاملات وبكل معاملة ٢٧ طائر تم توزيعهم على ٣ مكررات وبكل مكررة ٩ طيور فى تصميم عشوائى كامل. تم تكوين ٥ علائق حيث كانت المعاملة الأولى تحتوى على عليقة أساسية بدون أى إضافات وأستخدمت كمجموعة مقارنة سلبيه. المعاملة الثانية أحتوت على العليقة الأساسية مضاف لها مضاد حيوى تيروسين بمعدل ١٠٠ مجم /كجم عليقة وأستخدمت كمجموعة مقارنة ايجابية. المعاملة الثالثة والرابعة أحتوت على عليقة أساسية مضاف لها الزنجبيل بمعدل ١٢٥ مجم /كجم عليقة ، البروبوليس بمعدل ٥٠٠ ملجم / كجم عليقة على التوالى. المعاملة الخامسة أحتوت على عليقة أساسية مضاف لها خليط من الزنجبيل بمعدل ١٢٥ مجم /كجم عليقة + البروبوليس بمعدل ٥٠٠ ملجم / كجم عليقة . وقد أوضحت أهم النتائج مايلى:

لم تؤثر الاضافات على وزن الجسم النهائى أو معدل الزيادة فى وزن الطيور ولكن تلاحظ نقص معنوى فى أستهلاك العليقة فى المجاميع التى تناولت المضاد الحيوى والبروبوليس فى عليقتها مقارنة بمجموعة الكنترول السلبيه وكان معدل الانخفاض بمقدار ٢,١ ، ٣,٤ % على التوالى. المعاملة التى تناولت البروبوليس بمعدل ٥٠٠ ملجم / كجم عليقة حققت معنويا أفضل كفاءة تحويلية للعليقة حيث تفوقت هذه المعاملة بمقدار ٤,٢ % عن مجموعة الكنترول السلبيه. لم تؤدى جميع الاضافات المستخدمة الى أى تأثير على معاملات هضم البروتين الخام، الدهن، الألياف الخام، المادة العضوية، المستخلص الخال من النيتروجين. الوزن النسبى للذبيحة كان الأفضل فى المجموعة التى تناولت البروبوليس بمعدل ٥٠٠ ملجم / كجم عليقة ، حيث تفوقت هذه المعاملة على الكنترول بصورة غير معنوية بمعدل ٣,٤ %. لم يتأثر كل من الوزن النسبى للكبد ، القلب ، القونصة ، البنكرياس بالمعاملات المختلفة ولكن تلاحظ أنخفاض رقمى وغير معنوى فى الوزن النسبى لدهن البطن فى جميع المعاملات التجريبية مقارنة مع الكنترول. لوحظ تحسن فى الأجسام المضادة ضد مرض النيوكاسل في اليوم ٢١ بعد التحصين نتيجة لجميع المعاملات التجريبية مقارنة بالكنترول. وجد أنخفض معنوى فى تركيز الدهون الكلية، الجلسريدات الثلاثية، الكولسترول الكلى نتيجة للاضافات التجريبية المختلفة المستخدمة فى العليقة مقارنة مع الكنترول. زاد تركيز الكولسترول العالي الكثافة بصورة معنوية فى الطيور المعاملة بالزنجبيل والبروبوليس مقارنة مع الكنترول. أدت جميع المعاملات التجريبية الى زيادة معنوية فى كل من السعة الضد تأكسدية وزيادة فى نشاط الجلوتاثيون بيروكسيديز بينما سجل أنخفاض معنوى فى تركيز المالونديهيد نتيجة للأضافات المختلفة المستخدمة فى التجربة. وقد خلصت الدراسة الى أن الاضافات المستخدمة من بروبوليس نحل العسل والزنجبيل او مخلوط البربوليس مع الزنجبيل يمكن إستخدامهم في علائق السمان النامي لأنها تؤدي إلي تحسن في الكفاءة التحويلية والصفات المناعية وخفض مستوى الدهون فى سيرم دم الطيور وتحسين الصفات الضد تأكسدية.