EFFECT OF DIETARY SUPPLEMENTATION WITH DIFFERING LEVELS OF PROPOLIS ON PRODUCTIVITY AND BLOOD PARAMETERS IN BROILER CHICKS

Rabia J. Abbas

Department of Animal Resources,College of Agriculture,University of Basrah, Basrah , Iraq.

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ABSTRACT

The experiment was conducted to study the effect of adding propolis powder to the diet on productive , carcass characteristics and blood parameters in broiler chicks. Total of 180 1- day- old chicks were distributed randomly among four dietary treatments of propolis 0 , 0.5 , 1.5 and 2.5 g/kg diets . Each treatment was contain three replicate (15 birds / pen). The results revealed that propolis supplementation at levels of 0.5 and 1.5 g/kg significantly ($p<0.05$) improved final body weight, weight gains and feed conversion ratios during the period from 15 to 28 days and the accumulative period (1-28 days of age) . However, there was no significant difference among treatment in feed intake. There were no significant difference in carcass yield, in relative weights of liver , gizzard, heart , spleen , bursa of fabricius, in relative weight and length of the intestine , cecum , in carcass length at the end of the study. However , chicks fed 2.5 g / Kg propolis had significant ($p<0.05$) reduction in total serum protein and albumin while increases in cholesterol and glucose levels as compared with the other treatments . These result indicate that supplementary propolis powder at 0.5 and 1.5 % had beneficial effects on productive traits but no significant effect on carcass characteristics or the hematological parameters examined in broiler chicks.

INTRODUCTION

Various natural products have been substituted for antibiotics over the last several years in attempts to improve immune system function in fighting pathogens in humans and animals. These natural products have less side effects and desirable in food. Propolis is one substance which are naturally produced in many plants (1,2). Propolis is resinous, is dark green or brown in color, and has a pleasant fragrance of poplar buds, honey, wax and vanilla, although it can also have a bitter taste (3). It has been shown to be a non-specific immunostimulant (4). It contains a various of substances including phenolic compounds, such as flavonoids, aromatic acids and their derivatives, esters, alcohols and terpenoids (5), and rich in isoflavonoids (6,7) . Many factors affect propolis composition, such as collecting location , time and the plant source (8,9). Propolis has been shown to be effective against a various bacteria (7,10,11, 12) and against colonization of gastrointestinal tract with *Salmonella spp* (13) , viruses (14) , fungi (15), and molds (16) . It also has antioxidant properties (17 ,18). Propolis supplementation in broiler diets has been assessed in many studies, and positive effects have been reported, such as increase feed intake and body weight, reduced mortality (19 ,20, 21 ,22) and with improvement in growth performance , digestibility , egg shell thickness and egg weight on layer hen (23 , 24). Broiler chicks fed diet supplemented with 2.5 % propolis contributed to higher weight gains and better feed conversion, thus increasing production profitability by 9.7% (25) . A study by (26), chickens fed 250 mg propolis / kg diets showed significantly higher body weights and lower feed intake per kg body weight gain as compared with controls. Also , a combination of flower pollen and propolis at a ratio of 2.5 : 1 used as a feed additive increased the body weights of chickens by nearly 10 % versus the control group (27) . Denli (28) demonstrated that propolis supplementation at 1 g/kg feed, increased the growth performance and improved the serum lipid variables, such as HDL and LDL, with no effect on serum ALP, total protein, uric acid, cholesterol or triglycerides in quails . Ethanol- extracted propolis (2 g/Kg of diet) resulted in reduced stress behavior, increased growth performance, increased immune response and RBC count , haemoglobin concentration, and improved welfare through improved physical health in ducks (29). However, (30) , found no significant difference in performance or slaughtering traits in Japanese quail receiving 6 or 12 ml /kg propolis ethanolic extract.

On other hands , (31) reported that propolis - supplemented diets at levels of 500 or 2000 ppm did not significantly improve body weight, feed intake, or feed conversion in male broilers, whereas supplementation at 4000 ppm in starter diet or in both the starter and grower diets significantly decreased final body weight and total feed intake of male broiler. Also , (32) found that supplementation with 0, 40, 70, 100, 400, 700 and 1000 mg kg^{-1} of oil extract of propolis did not affect broiler performance. Ether extract of propolis (100, 250, 500 and 750 mg/kg) added to the diet resulted in significantly reduced body weight and reduced weight gain with no effect on feed intake , feed efficiency, or carcass characteristics in Ross broilers (33). Given this background, the objective of this study was to determine the effect of dietary supplementation with propolis on the productive performance in broiler chickens . We also examined whether propolis supplementation affected carcass characteristics, internal organ properties, and blood parameters .

MATERIALS AND METHODS

Animal Husbandry and Treatments

This study was conducted at the Poultry Research Farm, Animal Resource Department, College of Agriculture , University of Basra between 1/12/2012 and 28/12/2012. Total of 180 1- day -old broiler chicks were distributed randomly into four groups, each including three replicate battery cages (15 birds / cages) . Each group was fed on the one of the following experimental diets. Diet 1 was the control diet (with not supplementation). Group 2 ,3 and 4 were supplemented with propolis powder at 0.5 , 1.5 and 2.5 g/kg, respectively . All Group were formulated to meet the nutrient requirements of the broiler (Commercial recommendation). The composition of the basal diet is presented in Table 1. The birds were fed a starter diet until 20 days of age, followed by a finisher diet from 21 to 28 days. Each group was fed its own diet

Table(1) : Ingredients and composition of basal diet

Ingredient (%)	**Starter diet 1-20 day**	**Finisher diet 21-28 day**
Yellow corn	54.50	58.00
Wheat	09.00	12.00
Soybean meal (44%)	35.00	28.00
Vegetable oil	0.50	1.00
Limestone	0.50	0.50
Vitamin premix	0.25	0.25
Salt	0.25	0.25
Total	**100**	**100**
Calculated composition		
[1]ME (Kcal /Kg) diet	2926	3110
Crude protein (%)	22.20	20.14
Calorie: protein ratio	131.80	154.42
Calcium (%)	1.01	0.86
Phosphorus available (%)	0.47	0.41
Ether extract (%)	1.80	1.90
Crude fiber (%)	3.80	3.50
Lysine (%)	1.36	1.20
Methionine + Cystine (%)	0.91	0.81

[1]ME (Kcal /Kg) diet = Metabolizable energy

ad libitum for the 28- day period. Also, 24 h lighting was provided per day. Birds received all required vaccinations. Chicks were weighted at 14 and 28 days of age, and feed consumption and the feed conversion ratio (g feed: g weight gain) were measured during the experimental period.

Carcass characteristics

At the end of 28 days, six birds (3 males and 3 females) from each group were selected based on the average weight of the group and sacrificed, after the birds were manually eviscerated, the eviscerated carcass were measured . The intestine was separated from the rest of the gastrointestinal tract after it was removed from the bird. Intestinal and cecum length and weight were recorded. Other organs, including liver , gizzard , heart ,

spleen, and bursa of fabricius were also removed and weighed, and then the percentage of live weight (BW) was calculated.

Blood parameters

At the end of the experiment, six chick per treatment (three male , three female) were slaughtered , and blood sample were collected in tubes with or without heparin for hematological and biochemical assays, respectively. Packed cell volume (PCV) and Hemoglobin concentrations (Hb) were measured according to (34) and (35) respectively. Blood samples were collected in heparinized tubes were centrifuged (3000 rpm , 15 min, 25^{o}C) to obtain plasma. Serum samples were stored at –20 ºC until analyzed for total protein and albumin by a colorimetric method using a commercial kits (Biolab AS, France). Serum globulin was calculated by subtraction from total proteins. Blood serum cholesterol and glucose concentration were determined according to the methods of (36) using commercial kits (Biolabo AS).

Statistical analysis

All data were subjected to analysis of variance (ANOVA) using SPSS software (2001). Significant treatment means were assessed using the Least Significant Difference (L.S.D.) test at $p<0.05$ (37).

RESULT

Broiler Performance

The effect of dietary supplementation with propolis on the productive performance of broiler is presented in table 2 and 3. In comparison with the controls, body weight at 28 days of age was significantly ($p<0.05$) higher with propolis supplementation at 0.5 and 1.5 g/kg ,but not at 2.5 g/kg. Additionally, both at 0.5 and 1.5 g/kg propolis increased ($P < 0.05$) the weight gain of broiler chickens during the period from day 15 to 28 and

during the total experimental period (days 1-28 days) . Feed intake the same periods was not significantly affected by propolis,

Table(2): Fed diets containing different levels of propolis on the body weight and weight gain of broilers at 7, 14 and 28 days of age (Mean ±SE)

Dietary propolis g/kg	Body Weight (g)			Weight Gain (g)			
	7 d	14 d	28 d	1-7 d	8-14 d	15-28 d	1- 28 d
0.0	182.1 ± 2.88	584.8 ± 6.82	1752.9[b] ± 23.63	142.0 ± 2.88	402.7 ± 10.3	1168.15[b] ± 23.43	1712.9[b] ± 24.88
0.5	185.4 ± 1.36	601.7 ± 2.28	1892.9[a] ± 29.8	143.4 ± 1.37	416.3 ± 1.44	1291.15[a] ± 28.62	1852.22[a] ± 28.78
1.5	183.8 ± 2.98	596.6 ± 9.17	1819.4[a] ± 49.28	141.8 ± 3.0	412.2 ± 6.72	1222.8[a] ± 15.11	1779.4[a] ± 15.22
2.5	182.8 2.24	580.8 ± 0.69	1576.8[c] ± 21.3	142.8 ± 2.21	398 ± 2.93	995.9[c] ± 20.83	1536.8[c] ± 21.36
Significant	N.S	N.S	0.05	N.S	N.S	0.05	0.05

[a,b,c] Means in the same colum with no common superscript are different significantly ($p<0.05$). NS= None significant

although a significant decreased in fed intake ($p<0.05$) was observed at the high propolis level (2.5g/kg) versus the control . Table 3 shows the significant improvement in the feed conversion ratios at 0.5 and 1.5 g/kg during days 15 -28 and 1-28 compared with the control and the higher dose of propolis (2.5 g/kg).

Table(3): Fed diets containing different levels of propolis on the feed intake and feed conversion ratio of broilers at 7, 14 and 28 days of age (Mean ±SE)

Dietary propolis (g/kg)	Feed Intake (g)				Feed Conversion Ratio (g/g)			
	1-7 d	8-14 d	15-28 d	1- 28 d	1-7 d	8-14 d	15-28 d	1- 28 d
0.0	155.7 ± 4.72	480.1 ± 10.3	1761.6 [a] ± 27.63	2397.40 [a] ± 14.21	1.09 ± 0.012	1.19 ± 0.013	1.51 [b] ± 0.022	1.40 [a] ± 0.015
0.5	159 ± 0.29	491.8 ± 2.54	1818.1 [a] ± 24.51	2469.41 [a] ± 9.01	1.11 ± 0.008	1.18 ± 0.006	1.41 [b] ± 0.032	1.33 [b] ± 0.015
1.5	161.7 ± 3.38	477.9 ± 3.76	1823.1 [a] ± 35.63	2462.70 [a] ± 14.25	1.14 ± 0.015	1.16 ± 0.013	1.49 [b] ± 0.024	1.35 [b] ± 0.017
2.5	157.1 ± 2.88	467.3 ± 4.89	1651.6 [b] ± 23.35	2276.00 [b] ± 10.37	1.10 ± 0.003	1.18 ± 0.020	1.66 [a] ± 0.09	1.48 [a] ± 0.024
Significant	N.S	N.S	0.05	0.05	N.S	N.S	0.05	0.05

[a,b] Means in the same colum with no common superscript are different significantly ($p<0.05$),
NS= None significant

Carcass characteristics

propolis supplementation had no effect on carcass yield, relative weight or length of the intestine or cecum, carcass length, or the relative weight of the gizzard, heart , liver , spleen, or bursa of fabricius at the end of the study (Table 4).

Table 4: Carcass characteristic at 28 days of age of chicks receiving different levels of propolis (Mean ± SE)

Characteristics	Treatment of Propolis (g/kg)				Significant
	0	0.5	1.5	2.5	
Carcass yield (%)	71.97 ± 2.10	73.70 ± 2.17	73.21 ± 0.82	71.78 ± 0.67	NS
Liver weight %	3.08 ± 0.16	3.13 ± 0.12	3.08 ± 0.11	2.95 ± 0.16	NS
Gizzard weight %	1.88 ± 0.091	1.93 ± 0.073	1.92 ± 0.13	1.83 ± 0.064	NS
Heart weight %	0.463 ± 0.020	0.438 ± 0.022	0.442 ± 0.015	0.440 ± 0.001	NS
Spleen weight %	0.137 ± 0.429	0.143 ± 0.041	0.130 ± 0.031	0.129 ± 0.028	NS
Bursa of fabricius weight %	0.12 ± 0.017	0.06 ± 0.005	0.09 ± 0.008	0.06 ± 0.003	NS
Intestinal weight %	4.50 ± 0.18	5.17 ± 0.14	5.47 ± 0.43	6.36 ± 1.04	NS
Intestinal Length (cm)	172.35 ± 4.82	170.02 ± 11.56	191.14 ± 6.68	173.35 ± 5.19	NS
Cecum weight (g)	17.80 ± 0.07	14.63 ± 0.61	15.37 ± 1.55	15.63 ± 0.82	NS
Cecum Length (cm)	19.06 ± 1.20	18.07 ± 0.34	19.40 ± 0.59	20.07 ± 0.89	NS
Carcass Length (cm)	26.53 ± 0.43	27.20 ± 0.67	26.53 ± 0.43	26.20 ± 0.76	NS

NS= None significant

Blood parameters

Blood parameter results shown in Table 5. Chicks receiving the high propolis levels (2.5g/kg) showed significantly ($p<0.05$) decreased total serum protein, albumin, and

globulins levels and significantly increased ($p<0.05$) cholesterol and glucose levels compared with the control and other propolis treatments . However, hemoglobin concentration (Hb), packed cell volume (PCV) percent was not differ significantly among the treatment groups.

Table 5: Some blood parameters at 28 days of age of chick fed different level of propolis (Mean ±SE)

Dietary propolis (g/kg)	Albumin (g/dl^{-1})	Globins (g/dl^{-1})	Total Protein (g/dl^{-1})	Cholesterol (mg/dl^{-1})	Glucose (mg/dl^{-1})	Hb (gdl^{-1})	PCV (%)
0.0	2.26^{a} ± 0.03	1.81^{b} ± 0.21	4.07^{a} ± 0.05	96.03^{b} ± 3.85	136.33^{c} ± 8.88	11.50 ± 2.0	29.00 ± 0.33
0.5	1.90^{b} ± 0.06	2.43^{a} ± 0.06	4.34^{a} ± 0.09	94.70^{b} ± 2.45	165.66^{b} ±1.43	10.75 ± 0.25	28.50 ± 1.58
1.5	1.78^{b} ± 0.08	2.48^{a} ± 0.09	4.26^{a} ± 0.06	100.3^{b} ± 1.77	169.00^{b} ± 1.95	10.70 ± 1.35	28.43 ± 2.01
2.5	1.65^{c} ± 0.05	2.07^{b} ± 0.11	3.72^{b} ±0.05	122.80^{a} ±4.62	184.00^{a} ±5.33	10.93 ± 1.86	29.70 ± 1.98
Significant	S	S	S	S	S	N.S	N.S

Hb, Hemoglobin concentration; PCV, packed cell volume ; ^{a,b,c} Means in the same column with no common superscript are different significantly ($p<0.05$); NS, None Significant

DISCUSSION

The effect of dietary supplementation with propolis on the growth performance of broilers are shown in table 2 and 3. The addition of propolis at 0.5 and 1.5 g/kg increased growth parameters significantly in broiler chicks, such as body weight at 28 days , body weight gain during days

15 -28 and 1-28, and improved feed efficiency in the same time periods compared with controls and with the higher dose of propolis (2.5 g/kg; Table 3). Previous studies

reported that propolis supplementation in broiler diets showed positive effects on performance, such as increasing feed intake and body weight (19, 20, 21 ,22). It may be that, in addition to antioxidants activity, the components of propolis powder contributed antimicrobial properties, resulting in better intestinal health and improved digestion and absorption (14, 17). Chemical analyses of propolis have shown that it is rich in vitamins and minerals (38) and contains large amount of flavonoids and proteins (39), which may improve weight and feed efficiency in chicks. Our results consistent with the findings of (28), who reported that addition of propolis at 0.5, 1 or 1.5 g/kg to the diet increased growth parameters significantly in quail chicks. Similar results were obtained by (20), who found improved broiler performance with propolis extract supplementation versus control groups. These results were also similar to those of (29) in Muscovy broiler ducks. In contrast, (33) ,observed that Chinese propolis supplementation had adverse effects on performance of broilers. In the present study feeding propolis at 2.5 g/kg depressed growth, and this negative effect was not be compensated for by the end of the experiment. This results may have been due to the bitter taste of propolis, which may have negatively affect the broiler's desire for the diet or caused them to reject the diet (40) , as reflected in the significant decrease in total feed consumed at the high dosage of propolis (Table 3). Furthermore, (41), noted adverse effect of propolis on body weight and feed intake because the Propolis used in their studies, which was collected from pine trees, had a a strong and unique odour, volatile compounds, and a bitter taste. In the present study, there was no significant difference during the 15 -28 or 1-28 day feeding periods in feed consumption of broilers fed the control and propolis - supplemented diets at 0.5 or 1.5 g/kg. In contrast, treatment with 2.5g/kg propolis was

associated with reduced feed intake versus the other groups (Table 3). Our data indicated a significant ($p<0.05$) improvements in feed efficiency with propolis at 0.5 and 1.5 g/kg compared with the control and high- dose (2.5 g/kg) groups. These results were consistent with those of (28), who find better feed efficiency in the group fed 1 g/kg propolis than in controls. Differences in the results for performance characteristics may be depend on the differing types of propolis used and their geographic origin (28) . propolis supplementation had no effect on carcass yield, relative weight or length of the intestine or cecum, carcass length, or the relative weight of the gizzard, heart , liver, spleen, or bursa of fabricius at the end of the study (Table 4) . These results consistent with those of (28), who noted no difference in liver, gizzard, or intestinal weight or intestinal length in the group receiving 0.5, 1 and 1.5 g/kg propolis in the diet . Propolis supplementation at doses of 100, 250, 500 and 750 mg/kg did not significantly affect carcass characteristics of Ross broilers (33). In contrast to our results, (22) found that the addition of 400 mg/kg propolis improved the relative weights of the liver, heart, and thighs, and the dressing percentage of broilers . Also, (25) showed that dietary supplementation with ethanol extracts of propolis improved carcass yield in broilers under heat stress. The effects of propolis supplementation on blood parameters in broiler chicks are summarized in Table 5. The present results revealed significant ($p<0.05$) decreases in total serum protein, albumin, and globulins levels ,and significant increases ($p<0.05$) in cholesterol and glucose levels when chicks received the high propolis dose (2.5 g/kg) versus the control group. The present results also revealed no significant difference between control and propolis groups in hemoglobin concentration or packed cell volume percent. These results differ from the findings of (19), who

reported significant improvements in Hb levels, total serum protein, albumin, and globulins in Sasso chicks fed a diet containing propolis (2%) versus controls. In addition , (30) found significantly improved blood parameters in Muscovy broiler ducks fed diets supplemented with propolis . (29) reported that total protein, uric acid, cholesterol and triglycerides were unaffected by propolis supplementation in broiler diets. The results of (42) showed no significant difference in blood and immune system parameters in broiler chickens administered different levels of alcoholic extract propolis. From this study , it can be concluded that propolis supplementation in the diet at 0.5 and 1.5 g/kg had positive effects, enhancing productivity, with no significant negative effect on carcass characteristics or any hematological parameter assessed in broiler chickens .

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تأثير إضافة مستويات مختلفة من البروبوليس في الصفات الإنتاجية وبعض المعايير الدمية لفروج اللحم

ربيعة جدوع عباس

قسم الثروة الحيوانية ، كلية الزراعة ، جامعة البصرة ، البصرة ، العراق

الخلاصة

اجريت هذه الدراسة لمعرفة تأثير إضافة مستويات مختلفة من مسحوق البروبولس (العكبر) الى عليقة الافراخ في بعض الصفات الإنتاجية و المعايير الدمية لفروج اللحم . استخدم 180 فرخاً بعمر يوم واحد وزعت عشوائياً على أربعة معاملات تجريبية أضيف اليها مسحوق البروبولس بالمستويات 0 ، 0.5 ،1.5 و 2.5 غم/ كغم . تضمنت كل معاملة ثلاثة مكررات وبواقع 15 طير لكل مكرر . اظهرت النتائج حصول تحسن معنوي ($P<0.05$) في معدل وزن الجسم الحي (عند عمر 28 يوماً) والزيادة الوزنية ومعامل التحويل الغذائي خلال الفترتين 15-28 و

28-1 يوم) لأفراخ المعاملتين الثانية والثالثة والمغذاة على 0.5 و 1.5 غم /كغم بروبولس ، في حين اظهرت الافراخ التي تناولت المستوى العالي من البروبولس (2.5 غم/كغم) انخفاض معنوي في وزن الجسم النهائي والزيادة الوزنية الكلية ، بينما لم يكن للمستوى العالي تأثير في معامل التحويل الغذائي خلال الفترة (1-28 يوم) مقارنة مع مجموعة السيطرة. لم تشر النتائج الى وجود تأثير للبروبولس في نسبة التصافي والأوزان النسبية للكبد ، القانصة ، القلب ، الطحال ، غدة فابريشيا ، وزن الامعاء ، طول الامعاء والأعورين وفي طول الذبيحة عند نهاية التجربة . أدى استخدام مستوى 2.5 غم/كغم من البروبولس إلى حصول انخفاض معنوي في مستوى البروتين الكلي والألبومين، في حين حصل ارتفاع معنوي في مستوى كولسترول وكلوكوز مصل الدم مقارنة ببقية مستويات البروبولس المستخدمة .نستنتج من هذه الدراسة ان اضافة 0.5 و 1.5 غم /كغم من البروبولس كان له دور ايجابي في تحسين الاداء الانتاجي ، دون التأثير في صفات الذبيحة وبعض المعايير الدمية فروج اللحم .

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