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Effect of Propolis Supplementation on Productive Performance in Local Quail

Research Article

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ABSTRACT

This experiment was carried out at the College of Agriculture University of Salahaddin Erbil. To study the effect of water supplementation with propolis on local quail performance, some physiological and immunological characteristics at 42 days old. A total of one thousand fifty (1050) hatched local quail eggs that obtained from the project of Al-Rashedia for Agriculture Researches Center in Mousl governorate, were placed in the hatcheries machine, after 17 days the chicks were hatched. A total of four hundred fifty (450) unsexed day old quail chicks were randomly allocated into five treatment groups. Chicks in each treatment group (90 chicks) were subdivided into three replications (30 chicks for each). The five dietary treatment groups were as follows: T1) control, T2) (100 mg propolis/L water), T3) (200 mg propolis/L water), T4) (300 mg propolis/L water) and T5) (400 mg propolis/L water). Live body weight, body weight gain, feed consumption, feed conversion ratio; mortality percentage and daily egg production were recorded. At the end of the experiment, all chicks were slaughtered and production index (PI), dressing percentage and carcass cuts percentage were measured. The overall data shows the following results: water supplementation with different levels of propolis significantly ($P<0.05$) increased the live body weight, carcass weight, thigh %, back % and wing % compared to control group, level (3) 300 mg propolis/L water is better treatment for productive performance than other.

KEY WORDS carcass parts, productive performence, propolis, quail.

INTRODUCTION

Antibiotics have been added to poultry feed to improve growth performance, to stabilize intestinal microflora and to prevent infection by specific pathogenic microorganisms. However, concerns about antimicrobial resistance have existed for nearly as long, and recent concerns regarding the prevalence of antibiotic-resistant infections in humans have raised the controversy to new heights (Revington, 2002). For these reasons antibiotic growth promoters for poultry diets have been banned for use in the European Union and pressure from consumer groups and major poultry buyers have threatened their removal from diets in the US.

Therefore, studies on alternate products that can result in the promotion of growth, improved feed utilization, and maintenance of gut health are taking place (Zhang *et al.* 2005).

For this reason, the natural material propolis is being investigated (Canogullari *et al.* 2009). Propolis is a resinous material gathered by honeybees (*Apis mellifera caucasica*) from the buds and bark of certain trees and plants. Mix with wax and use in construction and adaptation of their nests (Bankova *et al.* 2000). Bees use propolis not only as a building material, but also as a means of maintaining low levels of bacterial and fungal concentrations in the hive, the action against microorganisms is an essential characteristic

of propolis and it has been used by human beings since ancient times for its pharmaceutical properties.

Propolis possesses antibacterial, antifungal, antiviral properties, and many other beneficial biological activities: anti-inflammatory, antiulcer, local anesthetic, hepatic-protective, antitumor and immune-stimulating. For this reason, propolis is widely used as a popular remedy in folk medicine, "health food" and for numerous further purposes (Bankova *et al*. 2000; Fatoni *et al*. 2008).

Propolis has an intensive and fine odor and a somewhat bitter taste. The color varies according to the geographical area and plant sources from light yellow up to dark brown (Açikgöz *et al*. 2005). In general, propolis in nature is composed of 30% wax, 50% resin and vegetable balsam, 10% essential and aromatic oils, 5% pollen, and other substances (Burdock, 1998).

Propolis is in no way a new discovery. The use of propolis goes back to ancient times, at least to 300 BC, and it has been used as a medicine in local and popular medicine in many parts of the world, both internally and externally. Egyptians, Greeks and Romans reported the use of propolis for its general healing activity and for the cure of some lesions of the skin. Propolis has always been reputed as an anti-inflammatory agent and to heal sores and ulcers.

Ancient Egyptians used it to embalm their dead, and more recently it was used during the war for healing wounds and tissue regeneration (Ghisalberti, 1979). However, its use continues today in remedies and personal products, and the list of preparations and uses is endless. It has only been in the last decades that scientists have investigated its constituents and biological properties (Naama *et al.* 2010).

The valuable taste and dietary properties of quail meat are pivotal in determining the growing interest of consumers in this product (Genchev *et al*. 2008). The incessant rise in feed cost and the resultant shortage in animal protein supply have encouraged the exploitation of locally, available and cheap animal and feed resources to forestall threat to the future of poultry production (Runjaic-Antic *et al.* 2010; Obuzor and Ntui, 2011; Agiang *et al.* 2011). The quails have unique characteristics and advantages over other species of poultry which include early attainment of sexual maturity, short generation interval, making it possible to have many generations in a year (Anon, 1991). Quail meat and egg are renowned for their high quality protein, high biological value and low caloric content (Agiang *et al.* 2011).

The study aimed to evaluate the effects of propolis supplementation to the drinking water of quail on some productive and physiological aspects, as well as, the immunological response to some viral disease as Newcastle and infections Bronchitis disease.

MATERIALS AND METHODS

A total one thousand and fifty (1050) hatching eggs from local quail strain obtained from Agriculture Researches of Alrashidia poultry breeding project in Mosul city were used. The eggs were placed in the hatcheries machines (Hatcher) under 37.5 ˚C and humidity 65-80%, after17 days the chicks were hatched. The sample of propolis was obtained from a field belonging to the Faculty of agriculture and forestry, Dohuk University. Four hundred and fifty (450) local quail chicks were reared at poultry farm of College of Agriculture University of Salahaddin. The house was divided into 15 floor cages (2×1.7) m^2. Three cages for each treatment. All chicks in the treatment groups were fed on a starter diet (1-14 days), grower diet from (15-21 days) and finisher diet (22-42 days) throughout the experimental period which is lasted for 6 weeks (Table 1).

Table 1 Diets ingredient (as percent) for experimental bird's starter grower and finisher diets and their calculated chemical analysis

Ingredient*	Starter	Grower	Finisher
Wheat	57.83	58.87	58.23
Soya bean meal	31	29	31
Breed mix	2.5	2.5	2.5
Sun flower oil	1.5	1	1
Wheat bran	4	5	4
Lime stone	1	1	1
Di calcium phosphate	0.5	0.5	0.5
Salt	0.1	0.2	0.2
Methionine	0.1	0.5	0.1
Lysine	1.02	0.98	1.02
Anti-coccidian	0.05	0.05	0.05
Choline	0.05	0.05	0.05
Mineral premix*	0.1	0.1	0.1
Bio vet premix*	0.1	0.1	0.1
Vitamin	0.1	0.1	0.1
Enzyme	0.05	0.05	0.05
Approximately analysis			
Crude protein %	21.93	21.29	22.0
Metabolizable energy kcal/kg	2886	2851	2850
C/P ratio	21.24	20.08	20.79
Crude fiber	4.31	4.26	4.28
TotalCa %	1.07	1.06	1.05
Available P %	0.69	0.68	0.70
Lysine %	1.02	0.98	1.02
Methionine %	0.59	0.60	0.61

*All feed ingredient taken from Kosar Company in Erbil.
* Premix 1 kg contain: vitamin A: 334000 IU; E: 67000 mg; D_3 500 mg; B_1: 167 mg; B_2: 1000 mg; B_6: 0.66 mg; B_{12}: 67 mg and Niacin: 1000 mg.
* Minerals: Fe: 1.667 mg; Mn: 3.334 mg; Colin: 17000 mg; Folic acid: 17 mg; Biotin: 1.33 mg; Zn: 2.667 mg; Cu: 334 mg; I: 17 mg; Methionine: 27.000 mg; Zn-bastracin: 667 mg; Anti-oxidant: 3.333 ppm; P: 10.6% and Na: 4-4.5%.
* NRC: chemical analysis of ingredient depending on NRC (1994).

The feed was *ad libitum* through the experimental period. Chicks in each treatment group (90 chicks) were subdivided into three replications (30 chicks for each). The five dietary treatment groups were as follows: T1) control, T2) (100 mg

propolis/L water), T3) (200 mg propolis/L water), T4) (300 mg propolis/L water) and T5) (400 mg propolis/L water).

The measured traits

During the course of the experiment, the effects of propolis supplementation on local quail performance and some physiological parameter were studied: live body weight, body weight gain, feed consumption, feed conversion ratio, mortality and liveability percentage of chicks, production index, egg production, dressing percentage, percentage of carcass parts.

Statistical analysis

Completely randomized design (CRD) was used to study the effect of propolis on different traits. Duncan multiple range test (1955) was used to test the difference among the means of the groups. The statistical analysis of data was carried out using the GLM (General linear model) with SPSS (2001).

RESULTS AND DISCUSSION

Table 2 refers to the effect of propolis on the live body weight. The treatment had significant (P<0.05) effect on live body weight at (2, 3, 4 and 6) weeks of age. The results were in agreement with the finding (Açikgöz *et al*. 2005; Sibel *et al*. 2007; Seven *et al*. 2008; Abdullah, 2009; Hassan and Abdulla, 2011) which indicate that the significantly increase in live body weight with the supplementation of propolis. This result is in contrast with the other findings (Sahin *et al*. 2003; Ziaran *et al*. 2005; Daneshmand *et al*. 2012) which indicate that the supplementation of propolis in the bird's diet had no significant effects on live body weight. This result due to the antimicrobial activity of the components of the extracts, resulting in better intestinal health and improving digestion and absorption (Denli *et al*. 2005). Propolis has been developed for use as an alternative to antibiotics in the animal industry because of its biological properties such as antimicrobial, antioxidant and antiseptic activities, that propolis reduce the population of the lactate-producing bacteria, which predominate in the upper gastrointestinal tract of the broiler. Although these bacteria (*Lactobacillus*, *Streptococci* and *Staphylococci*) may prevent *Salmonella* implantation, they are also largely responsible for retarded growth seen in pigs and chickens (O'connor-dennie, 2004). The reduction of the bacterial microflora may increase the nutrient availability because the competition for nutrients between the host animal and the microflora in a limited factor for growth (Seven *et al*. 2011).

Table 3 shows the effect of propolis on the body weight gain. The statistical analysis showed the significant differences between treatment and control groups in (2, 4 and 5) weeks of age. The results were in agreement with the finding (Shalmany and Shivazad, 2006; Seven *et al*. 2008; Seven *et al*. 2011 and Hassan and Abdulla, 2011) which indicate that the significantly increase in body weight gain with the supplementation of propolis. These results are in contrast with the finding (Sahin *et al*. 2003; Ziaran *et al*. 2005; Coloni *et al*. 2007; Canogullari *et al*. 2009; Daneshmand *et al*. 2012) which indicate that the supplementation of propolis in the bird's diet had no significant effects in body weight gain. This result due to the dietary supplementations in antibiotic (flavomycin) or with propolis have partially but significantly alleviated the alterations of the laying hen performance.

These findings were in agreement with previous reports which have demonstrated that growth promoters such as dietary antibiotics and propolis could give beneficial results when birds are not kept at optimal conditions like stress conditions (Botsoglou *et al*. 2002; Jang *et al*. 2004; Seven *et al*. 2008 and Seven *et al*. 2011). That this improved effect is partially due to its high content of flavonoids and increase feed intake than the control. Also, these findings are due to the antimicrobial activity of the components of the extracts, resulting in better intestinal health and improving digestion and absorption.

Table 4 refers to the effect of propolis supplementation on weekly and final feed consumption for local quail. All the treatment showed no significant differences in feed intake, including the control group. During the whole experimental period (2-6 weeks) of age. The result was in agreement with the finding (Sahin *et al*. 2003; Biavatti *et al*. 2003; Açikgöz *et al*. 2005; Ziaran *et al*. 2005; Canogullari *et al*. 2009) whom indicated that the dietary supplementation of birds with propolis had no significant effect on average daily feed consumption when compared with control. But, these results are in contrast with the other findings (Omar *et al*. 2003; Shalmany and Shivazad, 2006; Galal *et al*. 2008) whom recorded that the dietary supplementation of the bird's diet with propolis had significant differences in feed consumption when compared with the control group.

The result may be attributed to the lower dose of propolis and to the fact that birds were kept in hygienic conditions in cages where there were no challenging factors affecting the gastrointestinal health of the birds. Feed intake did not decrease in birds treated with propolis ethanol extract (PEE). It is likely that the organoleptic properties of propolis at the doses used are acceptable for the birds (Canogullari *et al*. 2009). Propolis has an intensive and fine odour and a somewhat bitter taste (Açikgöz *et al*. 2005). Table 5 shows the effect of propolis supplementation on weekly and final feed conversion ratio on Local quail.

Table 2 Effects of propolis supplementation on live body weight (g) of Local quail in different ages (Mean±SE)

Treatment	LBW (g) 7 days	LBW (g) 14 days	LBW (g) 21 days	LBW (g) 28 days	LBW (g) 35 days	LBW (g) 42 days
T1 control	51.33±0.88^{a}	76.67±1.66^{b}	125.00±2.88^{d}	170.00±2.88^{c}	196.04±0.92^{b}	219.61±0.50^{b}
T2 100 mg propolis/L	47.72±1.40^{a}	80.00±0.00^{b}	130.00±0.00^{cd}	171.67±1.66^{bc}	199.46±0.79^{a}	219.92±0.95^{ab}
T3 200 mg propolis/L	49.67±0.88^{a}	81.67±1.66^{b}	131.67±1.66^{bc}	178.33±1.66^{ab}	200.93±0.72^{a}	221.91±0.88^{a}
T4 300 mg propolis/L	49.55±1.55^{a}	81.67±1.66^{b}	136.67±1.66^{ab}	176.67±3.33^{abc}	200.73±1.18^{a}	221.66±0.29^{ab}
T5 400 mg propolis/L	49.20±1.33^{a}	86.67±1.66^{a}	138.33±1.66^{a}	180.00±0.00^{a}	200.44±0.95^{a}	221.83±0.30^{a}

The means within the same column with at least one common letter, do not have significant difference (P>0.05).
LBW: live body weight.
SE: standard error.

Table 3 Effects of propolis supplementation on body weight gain (g) of Local quail in different ages (Mean±SE)

Treatment	BWG (g) 2 weeks	BWG (g) 3 weeks	BWG (g) 4 weeks	BWG (g) 5 weeks	BWG (g) 6 weeks	BWG (g) 2-6 weeks
T1 control	25. 33±0.88^{c}	48.33±1.66^{a}	45.00±0.00^{ab}	26.04±2.04^{a}	23.57±.49^{a}	168.27±0.39^{a}
T2 100 mg propolis/L	32.28±1.40^{b}	50.00±.00^{a}	41.67±1.66^{ab}	27.79±.91^{a}	20.46±1.35^{a}	172.20±1.37^{a}
T3 200 mg propolis/L	32.00±1.15^{b}	50.00±2.88^{a}	46.67±1.66^{a}	22. 60±1.00^{ab}	20.98±.64^{a}	172.25±1.46^{a}
T4 300 mg propolis/L	32.11±2.11^{b}	55.00±2.88^{a}	40.00±2.88^{b}	24.07±2.58^{ab}	20.92±1.44^{a}	172.10±1.84^{a}
T5 400 mg propolis/L	37.47±1.79^{a}	51.67±1.66^{a}	41.67±1.66^{ab}	20.44±.95^{b}	21.39±0.75^{a}	172.63±1.26^{a}

The means within the same column with at least one common letter, do not have significant difference (P>0.05).
BWG: body weight gain.
SE: standard error.

Table 4 Effects of propolis supplementation on feed intake of local quail (Mean±SE)

Treatment	FI (g) 2 weeks	FI (g) 3 weeks	FI (g) 4 weeks	FI (g) 5 weeks	FI (g) 6 weeks	FI (g) 2-6 weeks
T1 control	58.33±0.96^{a}	59.70±0.55^{a}	80.00±2.50^{a}	96.93±9.72^{a}	102.08±7.16^{a}	397.05±17.93^{a}
T2 100 mg propolis/L	60.45±1.98^{a}	57.50±2.50^{a}	80.83±1.66^{a}	101.47±3.79^{a}	108.18±3.94^{a}	408.43±8.31^{a}
T3 200 mg propolis/L	58.33±2.91^{a}	55.83±0.96^{a}	80.28±0.56^{a}	96.95±3.61^{a}	104.03±5.90^{a}	395.43±5.66^{a}
T4 300 mg propolis/L	61.13±0.73^{a}	57.48±3.00^{a}	79.42±2.15^{a}	104.57±1.21^{a}	108.50±12.99^{a}	411.10±17.47^{a}
T5 400 mg propolis/L	57.58±0.49^{a}	57.88±.38^{a}	78.42±0.51^{a}	101.97±3.64^{a}	109.77±4.73^{a}	405.62±8.49^{a}

The means within the same column with at least one common letter, do not have significant difference (P>0.05).
FI: feed intake.
SE: standard error.

Table 5 Effects of propolis supplementation on feed conversion ratio of local quail (Mean±SE)

Treatment	FCR 2 weeks	FCR 3 weeks	FCR 4 weeks	FCR 5 weeks	FCR 6 weeks	FCR 2-6 weeks
T1 control	2.31±0.07^{a}	1.24±0.05^{a}	1.78±0.05^{a}	3.81±0.61^{a}	4.35±0.38^{a}	2.36±0.10^{a}
T2 100 mg propolis/L	1.88±.14^{b}	1.15±0.05^{ab}	1.95±0.11^{a}	3.67±0.24^{a}	5.31±0.24^{a}	2.37±0.06^{a}
T3 200 mg propolis/L	1.84±0.15^{b}	1.12±0.04^{ab}	1.73±0.07^{a}	4.32±0.33^{a}	4.98±0.43^{a}	2.30±0.01^{a}
T4 300 mg propolis/L	1.92±0.13^{b}	1.05±0.03^{b}	2.01±0.12^{a}	4.45±0.49^{a}	5.16±0.37^{a}	2.39±0.07^{a}
T5 400 mg propolis/L	1.54±0.07^{b}	1.12±0.03^{ab}	1.89±0.06^{a}	5.01±0.24^{a}	5.15±0.31^{a}	2.35±0.04^{a}

The means within the same column with at least one common letter, do not have significant difference (P>0.05).
FCR: feed conversion ratio.
SE: standard error.

The treatment had significant (P<0.05) effect on the feed conversion ratio at (2 and 3 weeks of age). The results were in agreement with the other findings (Biavatti *et al*. 2003; Sahin *et al*. 2003; Açikgöz *et al*. 2005; Canogullari *et al*. 2009) that indicated that addition of propolis to the birds' diet did not affect feed ratio. The result may be due to that propolis supplementation did not affect feed intake. It is supposed that the improvement in feed conversion ratio is resulted from the increase in appetite due to the stimulation of salivary and gastric glands by propolis extract and decrease in pathogenic bacteria a more stable intestinal flora and hence, a better digestibility. The unagreement of these findings with those of our study can be attributed the amount of propolis used and the different geographic region where it was collected (Tekeli *et al*. 2010). In our study, no mortality rate was recorded in all the treatments during the whole of the experimental period (2-6) weeks of age. The results were in agreement with the other findings (Shalmany and Shivazad. 2006; Seven *et al*. 2008; Seven *et al*. 2011) whom showed that the dietary supplementation of birds with propolis had significant effect on mortality rate. The result may be due to propolis stimulated the immune system and decreased mortality rate by improving immunity (Giurgea *et al*. 1981). Propolis was reported to have effects on immunity by increasing macrophage activity, changing microbial populations in intestine lumen and stimulating lymphatic tissues (Taheri *et al*. 2005). Furthermore, antioxidant (Nagei *et al*. 2003; Kumazawa *et al*. 2004) and anti-inflammatory (Dimov *et al*. 1991; Borrelli *et al*. 2002) qualities of propolis have a significant effect on the immune system. The dietary supplementations with antibiotic propolis have partially but significantly alleviated the alterations of the laying hen performance.

These findings were in agreement with previous reports which have demonstrated that growth promoters such as dietary antibiotics and propolis could give beneficial results when birds are not kept at optimal conditions like stress conditions (Seven *et al*. 2008; Seven *et al*. 2011). The antimicrobial properties of propolis which is of value as a growth promoting agent and their high nutritive value.

The effect of propolis supplementation on (L.B.W, carcass weight, Dressing percentage, breast %, thigh %, back %, wing % and viscera %) on Local quail can be seen in Table 6. As the statistical analysis results showed that the propolis supplementation significantly (P<0.05) affected the live body weight (LBW), carcass weight, thigh %, back % and wing % at 42 days of age. The results were in agreement with the finding (Sahin *et al*. 2003; Seven *et al*. 2008; Abdullah, 2009; Hassan and Abdullah, 2011). Who found that the propolis supplementation on bird's diet had significant effects on carcass weight at 42 days of age due to the increase in bird weight and increased feed consumption (Hassan and Abdulla, 2011). But, the results were in contrast with the finding (Ziaran *et al*. 2005; Coloni *et al*. 2007; Canogullari *et al*. 2009; Seven *et al*. 2011), whom indicated that the supplementation of propolis in birds diet had no significant effects on carcass weight. The addition of propolis in the diet significantly increased growth parameters of quail chicks such as body weight gain and feed consumption and improved feed efficiency compared with control during a 35 day feeding period. It could be inferred that the antimicrobial activity of the components of the propolis extract, resulted in better intestinal health and improved digestion and absorption. Table 7 refers to the effect of propolis supplementation on production index of Local quail at 42 days of age.

Table 6 Effects of propolis supplementation on carcass weight (g) of local quail at 42 days (Mean±SE)

Treatment	LBW (g)	Carcass W (g)	DP (%)	Breast (%)	Thigh (%)	Back (%)	Wing (%)	Viscera (%)
T1 control	213.33±8.73^{ab}	151.00±7.25^{ab}	70.73±1.69^{a}	37.82±1.46^{a}	21.59±0.56^{b}	26.17±1.46^{ab}	7.38±0.33^{b}	7.03±0.41^{a}
T2 100 mg propolis/L	223.67±7.65^{ab}	151.00±6.14^{ab}	67.59±2.07^{a}	38.02±1.31^{a}	23.44±0.40^{a}	22.19±1.17^{b}	9.35±0.78^{a}	7.01±0.63^{a}
T3 200 mg propolis/L	236.50±8.24^{a}	161.33±5.90^{a}	68.29±1.54^{a}	36.28±1.17^{a}	23.77±0.52^{a}	23.86±1.75^{ab}	9.30±0.34^{a}	6.79±0.50^{a}
T4 300 mg propolis/L	207.50±10.12^{b}	142.00±3.93^{b}	68.83±2.00^{a}	35.02±0.88^{a}	23.24±0.28^{a}	27.90±1.59^{a}	7.25±0.61^{b}	6.60±0.40^{a}
T5 400 mg propolis/L	200.33±9.84^{b}	139.83±2.49^{b}	70.30±2.13^{a}	37.64±1.99^{a}	23.48±0.34^{a}	25.89±2.07^{ab}	6.79±0.59^{b}	6.20±0.44^{a}

The means within the same column with at least one common letter, do not have significant difference (P>0.05).
LBW: live body weight; Carcass W: carcass weight and DP: dressing percentage.
SE: standard error.

Table 7 Effects of propolis supplementation on production index and egg production of local quail at 42 days old (Mean±SE)

Treatment	Production index	Egg production 35-42 days
T1 control	22.25±1.04^{a}	61.00±3.60^{a}
T2 100 mg propolis/L	22.10±0.58^{a}	71.67±6.96^{a}
T3 200 mg propolis/L	23.02±0.17^{a}	75.33±8.19^{a}
T4 300 mg propolis/L	22.15±0.66^{a}	81.33±16.95^{a}
T5 400mg propolis/L	22.50±0.44^{a}	72.67±12.99^{a}

The means within the same column with at least one common letter, do not have significant difference (P>0.05).

There were no significant differences on production index being (22.25, 22.10, 23.02, 22.15 and 22.50) respectively.

Table 7 shows the effect of propolis on the egg production .The statistical analysis result showed that the propolis supplementation had not been significantly affected to the egg production at 42 days of age. This results are contrast with the finding Galal *et al*. (2008), who observed that the increase feed intake and egg mass in Propolis groups, resulting in significantly improve feed conversion ratio compared to control-group lead to increase the egg production.

CONCLUSION

Productive Aspects: Water supplementation with propolis enhances final body weight, and improve feed conversion ratio at 2nd and 3rd weeks of treatments, as well as, improvements in thigh %, level (3) 300 mg propolis/L water is better treatment for productive performance than other.

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