



Effect of Propolis as Additive on Some Behavioural Patterns, Performance and Blood Parameters in Muscovy Broiler Ducks

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Accepted 28 February 2013

Abstract

Forty Muscovy ducklings of one day old were used in this study. They were brooded together for 3 weeks and then were randomly divided into two groups, 20 ducklings per each. Each group was housed in a well ventilated, previously cleaned, disinfected and well bedded with saw dust 3 x 3 m pen. Birds were maintained at 33 °C using gas heater and the temperature was gradually reduced by 3 °C / week until 21 °C was reached and then continued to the end of the experiment. Continuous lighting program with 23 hours light to one hour dark was maintained by the natural day light and a 60 watt bulb that placed centrally in each pen at 2 meters height above the heads of birds. Birds were daily fed ad-libitum on a commercial duck broiler starter ration up to 3 weeks of age and on a duck broiler grower finisher ration till 12 weeks old. The first group was fed on these diets without any supplements and used as a control group, however, the second one was fed the finisher rations provided and thoroughly mixed with ethanol extracted propolis at a rate of 2 gm / Kg of diet. Water was freely available all over the experiment. Behaviour, performance and blood parameters of the experimented birds were carried out. Obtained results indicated that use of propolis as a natural feed additive reflected on ducks with a reduction in stress behaviour, increased growth performance, increased immune response and resistance and improved welfare through improving the physical health state.

Keywords: Propolis; behavior; performance; blood parameters; Muscovy broiler ducks

Introduction

Stock health and welfare management are key factors in animal health and food safety. The application of in-feed antibiotic growth promoters in livestock diet threatens consumer health and has arisen into a controversial issue worldwide. Many countries tend to prohibit the use of antibiotics as growth promoters due to their effects and their residual problems in tissue and eggs of birds. Supplementation of natural components in poultry diet is now widely distributed in the world. These components are served as growth promoters, which are healthful and help to improve the production performance of animal and poultry without any harmful effect (El-Ghamry *et al.*, 2002).

Propolis is one of these components. It is an adhesive, dark yellow to brown coloured exudates. It

collected by bees from buds, leaves and similar parts of trees and plants like pine, oak, eucalyptus and chestnut and mixed with their wax (Valle, 2000). It is considered as an excellent natural antibiotic and immune system booster (Bratter *et al.*, 1999). It has a strong antibacterial activity in addition to antifungal, antiviral and antiprotozoal properties (Scheller *et al.*, 1999). Propolis supplementation is used in many studies in poultry diet with positive effects on its welfare and performance like increase in feed intake and body weight (Shalmany and Shivazad, 2006; Tatli Seven *et al.*, 2008). It is also used as antioxidant, antimicrobial and antimutagenic based on its rich flavonoid, phenolic acid terpenoid contents (Kimoto *et al.*, 1999; Prytyk *et al.*, 2003; Wag *et al.*, 2003).

The purpose of the present study was to determine the possible beneficial effects of dietary propolis on some behavioural patterns, performance and some hematological parameters in Muscovy broiler ducks.

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Materials and methods

Animals, housing and feeding

Forty Muscovy ducklings of one day old were used in this study. They were brooded together for 3 weeks and then were randomly divided into two groups, 20 ducklings per each. Each group was housed in a well ventilated, previously cleaned, disinfected and well bedded with saw dust 3 x 3 m pen. Birds were maintained at 33 °C using gas heater and the temperature was gradually reduced by 3 °C / week until 21 °C was reached and then continued to the end of the experiment. Continuous lighting program with 23 hours light to one hour dark was maintained by the natural day light and a 60 watt bulb that placed centrally in each pen at 2 meters height above the heads of birds.

Birds were daily fed ad-libitum on a commercial duck broiler starter ration of 22% crude protein and 2900 K cal / Kg metabolizable energy up to 3 weeks of age and on a duck broiler grower finisher ration of 16% crude protein and 3000 K cal / Kg metabolizable energy till 12 weeks old. The first group was fed on these diets without any supplements and used as a control group, however, the second one was fed the finisher rations provided and thoroughly mixed with ethanol extracted propolis at a rate of 2 gm / Kg of diet (Tatli Seven *et al.*, 2008). Water was freely available allover the experiment.

Measurements

Behavioural observations

The behaviour of the experimented ducklings was carried out according to Altmann (1974) and Fraser and Proom (1990) using direct observations and scan sampling technique where the observer can study all tested ducklings without being seen by them. Observations were carried out in the morning between 9:00 and 11:00, in the afternoon between 12:00 and 14:00 and before dusk between 15:00 and 17:00. This design gave a chance to observe the ducks in each group for 3 hours / day for 3 days / week for the last four weeks of the experiment. By the end of the experiment, the percentage of ducks performing a specific behavioural activity was calculated.

Behaviour was classified into 5 mutually exclu-

sive categories according to Denbow *et al.* (1984) and Martrenchar *et al.* (1999) which are standing, resting, feeding, drinking and moving, including walking and running.

Moreover, feather pecking was recognized and calculated as number of pecks / head / recorded hour. It was defined as pecking the plumage or other tissues of other birds with or without pulling feathers (Aerni *et al.*, 2000).

Duck performance

On the first day of the experiment, ten ducklings from each group were randomly picked up, weighed and identified using different coloured paints on its back. They were weighed weekly till the end of the experiment where body weight gain, food consumption and food conversion efficiency were recorded.

Blood parameters

By the end of the experiment, five ducks were randomly chosen and slaughtered. During the exsanguinations, two blood samples, 2 – 3cm each, were collected.

One sample was collected in a heparinized tube to determine the haematological parameters of the blood. Counting of erythrocytes and leukocytes were performed according to Natt and Herrich (1952), packed cell volume was determined according to Wintrobe (1961). Whole blood smears were prepared and stained by Gemsa stain and leukocytic differential count was determined microscopically according to Mac-Gregor (1940). Hemoglobin was assayed by a colorimetric method using a commercial kit (spectrum hemoglobin diagnostic kits manufactured by Egyptian company for biotechnology, Cairo, Egypt).

The other sample was collected in a test tube without anticoagulant to determine the chemical blood parameters. The tubes were kept at the room temperature for 30 minutes then stored at a refrigerator for 60-90 minutes and then centrifuged at 3000 r.p.m for 10 minutes and the separated serum was transferred to Eppendorf tube using micropipette. The serum samples were kept at –20 °C until analyses for its total protein and albumin by a colorimetric method using a commercial kits (spectrum total protein and spectrum albumin diagnostic kits) manufactured by Egyptian company for

biotechnology, Cairo, Egypt. However, serum globulin was calculated by subtraction from total proteins.

Statistical analysis

Results were expressed as the mean ± SE. All data were analyzed using independent t-test with the aid of SPSS 11.0 statistical software (Spss, Inc, Chicago, IL, 2001).

Results

The effect of propolis as an additive to the diet on some behavioural patterns of ducks was indicated in Table (1). The data represented in Table (2) showed the weight of the experimented ducks at three and twelve weeks old. A comparison of some hematological parameters of ducks fed on control and propolis added diets was presented in Table (3).

Discussion

Mean percentages of ducks standing, resting, feeding, drinking and moving per observation hour were 40, 60, 20, 10, 10 and 60, 40, 20, 10, 30 with control and propolis additive diets, respectively. These data indicated that, percentage of ducks standing and moving were significantly increased with adding propolis, while resting was significantly decreased (P<0.01). However, feeding and

drinking were insignificantly affected. This may be attributed to the improving effect of propolis as a growth promoting agent on the health status and activity of the bird (Aziz, 1981; Bonomi *et al.*, 2002; El-Kaiaty *et al.*, 2002).

The influence of addition of propolis to the diet on the incidence of feather pecking was indicated in table (1). Ducks fed a diet provided with propolis had a highly significant (P<0.01) lower incidence of feather pecking than control one. The results were 1.22 and 9.82 No./Hour, respectively. This finding may be attributed to the high nutritive values of propolis as additive to the diets (Haro *et al.*, 2000; Bonomi *et al.*, 2002).

Ducks fed a diet with propolis were significantly (p<0.01) heavier in weight at 12 weeks than control one (7.393 and 6.242 kg, respectively). Weight gain of ducks fed control and propolis added diets were 5.830 and 6.975 kg, respectively. These data indicated a significant (p<0.01) improvement of weight gain of propolis added group.

With regard to feed consumption and feed conversion efficiency, the data indicated a non significant difference in feed consumption of ducks fed control and propolis added diets (25.419 and 24.273 kg, respectively). In contrast, ducks in propolis added group showed a significant (p<0.01) improvement in feed conversion than control one (3.48 and 4.36 g food / g gain, respectively). These results were agreed with that of Bonomi *et al.* (2002). The differences in the obtained results of

Table 1. Effect of propolis as additive on some behavioural patterns of Muscovy ducks

Pattern	Treatment		“P” Value
	Control	Propolis	
Standing (%)	40	60	<0.01
Resting (%)	60	40	<0.01
Feeding (%)	20	20	NS
Drinking (%)	10	10	NS
Moving (%)	10	30	<0.01
Feather picking (No. / hour)	9.82	1.22	<0.01

Table 2. Effect of propolis as additive on the performance of Muscovy ducks

Parameter	Treatment		“P” Value
	Control	Propolis	
Body weight at 3 weeks (kg)	0.412±0.017	0.418±0.019	NS
Body weight at 12 weeks (kg)	6.242 ± 0.048	7.393 ± 0.016	<0.01
Weight gain (kg/duck)	5.830±0.032	6.975±0.056	<0.01
Feed consumption (kg/duck)	25.419 ± 0.061	24.273 ± 0.078	NS
Feed conversion efficiency (g food/g gain)	4.36	3.48	<0.01

NS= None significant

Table 3. Effect of propolis as additive on some haematological of Muscovy ducks

Parameter	Control	Propolis	"P" Value
RBCs count ($\times 10^6/\text{mm}^3$)	2.21 \pm 0.05	3.82 \pm 0.08	<0.01
Packed cell volume (%)	28.35 \pm 0.29	30.56 \pm 0.42	NS
Haemoglobin conc. (g/dl)	9.76 \pm 0.18	11.21 \pm 0.22	<0.05
Total leukocytic count ($\times 10^3/\text{mm}^3$)	27.82 \pm 2.98	30.36 \pm 3.01	NS
Differetial leukocytic %			
Heterophils	22.11 \pm 0.39	22.32 \pm 0.88	NS
Lymphocytes	64.32 \pm 1.21	68.89 \pm 0.86	<0.01
Monocytes	9.55 \pm 0.82	5.30 \pm 0.78	<0.01
Eosinophils	2.12 \pm 0.18	1.95 \pm 0.66	NS
Basophils	1.90 \pm 0.29	1.54 \pm 0.34	NS
Serum total protein (g/dl)	5.24 \pm 0.28	7.92 \pm 0.52	<0.01
Albumin (g/dl)	3.21 \pm 0.22	4.41 \pm 0.28	<0.01
Total globulin (g/dl)	2.03 \pm 0.06	3.51 \pm 0.24	<0.01

NS= None significant

the performance characteristics may be attributed to the antimicrobial (antibacterial, antifungal, antiviral and antiprotozoal) properties of propolis which are of value as growth promoting agent as a result of prevention of subclinical infections (Brander *et al.*, 1982; Hanafy and Hatem, 1991; Scheller *et al.*, 1999). Moreover, propolis is known to contain protein, amino acids, vitamins (A, B1, B2, B3 and biotin), flavinoids and minerals, which are important matters in increasing the growth performance (Aziz, 1981; Rathee *et al.*, 1982; Awadalla and Azza, 2000).

With regard to the erythrocytic parameters, RSCs count was significantly increased ($P < 0.01$) in ducks fed a diet supplemented with propolis than control one (3.82 and 2.11 $\times 10^6/\text{mm}^3$, respectively). Moreover, ducks in group fed diet with propolis had a significantly higher ($P < 0.05$) haemoglobin concentration than those in control one (11.21 and 9.76 g/dl, respectively), however, packed cell volume was not significantly differed (28.35 and 30.56 % for control and propolis groups, respectively).

Leukocytic count was not significantly affected by addition of propolis. The results were 27.82 and 30.36 $\times 10^3/\text{mm}^3$ with control and propolis groups, respectively. Analysis of differential leukocytic percentages indicated a non significant difference in the percent of heterophils, eosinophils and basophils, however, the ducks fed a diet with propolis showed a significant higher percent of lymphocytes

and lower percentage of monocytes than control one (68.89 and 5.30 % for propolis group, 64.32 and 9.55 % for control one, respectively).

Adding propolis to the diet of ducks was reflected with significant higher contents of its serum total protein, albumin and total globulin. The data were 5.24, 3.21, 2.023 and 7.92, 4.41, 3.51 g/dl for control and propolis group, respectively.

The increased percent of lymphocytes in ducks fed diets with propolis may be related to its effect as antibacterial, antiviral and antifungal on their immunity system. Meanwhile, the improvement of haemoglobin %, packed cell volume %, RBCs count, serum total protein and its fractions in the group fed propolis may be related to its direct effect as a growth promoter on the haemopoietic tissue and the stimulating effect on the liver exhibiting an anabolic action favoring protein synthesis and also its preserving effect on the body protein from degeneration (Aziz, 1981; Brander *et al.*, 1982; James *et al.*, 1994; Bonomi *et al.*, 2002).

Conclusion

It could be concluded that the use of propolis as a natural feed additive reflected on ducks with a reduction in stress behaviour, increased growth performance, increased immune response and resistance and improved welfare through improving the physical health state.

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