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Research Article
Effect of Dietary Supplementation with Different Levels of Palm Pollen on the Physiological Performance of the Broiler

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Abstract

Objective: This experiment was conducted to study the effects of Palm pollen on the levels of lipids, proteins, enzymes, glucose, phosphorus, calcium and uric acid concentrations in the blood of broilers. **Materials and Methods:** Ninety-six chicks of the Ross 308 breed of both sexes, with an initial weight of 38 g/chick, were used. Chicks were distributed randomly into 4 treatment groups with 3 replicates (8 birds/replicate). Experimental treatments were divided as follows: T1-Control, T2-diet supplemented with palm pollen 200 g/100 kg, T3-diet supplemented with palm pollen 400 g/100 kgt and T4-diet supplemented with palm pollen 600 g/100 kg. A completely randomized design (CRD) was used to investigate the effects of the studied treatments on different traits. **Results:** The plasma lipid panel indicated that there were no significant differences among treatments for all characteristics in the 3rd and 5th weeks of the experiment, except for cholesterol and low-density lipoprotein (LDL) in the 3rd week, where the supplemented treatment resulted in a significant decrease for these characteristics. The results of the blood enzyme test indicated that T1 resulted in significantly increased ($p<0.05$) levels compared to the other treatments in the 3rd week of the experiment. The results also show that there were no significant differences among treatments in the 5th week of the experiment when measuring aspartate amino transferase (AST) and alkaline phosphatase (ALP), but it was found that there were significant differences when measuring alanine amino transferase (ALT), where T3 was higher than the rest of the treatments in the 3rd week of the study. It is worthwhile to mention that there was a significant difference ($p<0.05$) for the supplementing treatments in the 5th week when measuring blood glucose. The uric acid concentration showed significantly higher results ($p<0.05$) for T1 than the rest of the treatments. It was also found that calcium was significantly higher for T4 in the 3rd week of the study, while phosphorus was significantly higher for all supplementing treatments in the 3rd week of the study. **Conclusion:** The addition of palm pollen to the diet improved all the qualities studied.

Key words: Palm pollen, physiological performance, blood lipids, blood enzyme, *Phoenix sylvestris*, calcium, phosphorus, broiler

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Competing Interest: The author has declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Plants and Medical Herbs occupy a large and distinctive place in worldwide agricultural production because they contain effective natural materials that are of interest and importance for their therapeutic activities and physiological impacts[1] Additionally, these plants contain chemical compounds that have an effective impact on the human body and animals, such as saponins, flavonoids and volatile oils. Therefore, they are considered an important source of medicinal treatment for different diseases[2] and do not have a negative impact on humans or animals. The importance of pollen has emerged as it has been proven that it has a significant impact on the productivity of poultry[3]. The Egyptian civilization described pollen as a "fountain of youth" and its products have spread in all parts of the world for food and medicinal purposes[4]. Pollen is considered a rich source of mineral elements such as copper, boron, cobalt, selenium, nickel, molybdenum, manganese, zinc, iron and rich, saturated fatty acids[5]. Steroids and glycoside are also found in palm pollen[6]. Pollen also contains flavonoids,[7] which are antioxidants[8]. All of these food attributes enable an increase in immunity and resistance to infections[9]. Because of the absence of studies on the impact of the use of palm pollen in a broiler diet, this study aimed to evaluate the effect of palm pollen on the physiologic performance of broilers.

MATERIALS AND METHODS

This experiment was carried out in the poultry section of the animal production program in the college of Agriculture, University of Baghdad for 35 days (12th March, 2016-16th April, 2016) to study the impact of adding palm pollen to the diets of broilers on some physiological traits.

In this study, 96 chicks of the Ross 308 breed of both sexes were used and were supplied by a private hatchery, with an initial weight of 38 g/chick. Chicks were distributed randomly into 4 treatment groups with 3 replicates (8 birds/replicate). The chicks were fed with a starter diet from day 1-21 and with a finisher diet from day 21-35 as shown in Table 1. Experimental treatments were divided as follows: T1-Control, T2-supplemented with palm pollen at 200 g/100 kg diet, T3- supplemented with palm pollen at 400 g/100 kg diet and T4-supplemented with palm pollen at 600 g/100 kg diet. Variables measured were blood lipids, blood enzymes, glucose, phosphorus, calcium and uric acid.

Blood samples were collected from the brachial vein from 6 birds chosen randomly from each treatment in the 3rd week of the experiment. In the 6th week of the experiment, blood was collected from the jugular vein into test tubes that did not contain anti-coagulant and were placed horizontally. After that, the samples were put in the centrifuge at 3000 cycles/min for 15 min to separate plasma, then closed tightly and frozen at -15--20 degrees until the tests were performed. The statistical computations were performed using the SAS program[11] based on a completely randomized design (CRD) to study the effects of different factors on the studied characteristics. Means with significant differences were compared using a Duncan multiple range test[12] and statistical significance was determined at $p \leq 0.05$.

Table 1: Proportion and chemical composition of feed materials used in the experimental diet

Components	Starter diet (%)	Finisher diet (%)
Corn	30.05	39.5
Wheat	28.95	25
Soybean	31	24.5
Protein concentrated	5	5
Sun flower oil	2.9	4
D.C.P.	0.7	0.9
Limestone	0.9	0.6
NaCl	0.3	0.3
Minerals and vitamin mixture	0.2	0.2
Total	100	100
Chemical compositions*		
Protein (%)	23.01	20.43
Metabolism energy (Kilogram/Kilocalorie)	3037.32	3167.65
Ca (%)	0.86	0.75
P (%)	0.44	0.48
Meth (%)	0.48	0.45
Meth+Cy (%)	0.84	0.79

*The chemical composition of the diet was estimated according to NRC[10]

RESULTS AND DISCUSSION

In the 3rd week of the experiment cholesterol and low density lipoprotein (LDL) was significantly higher in T1 than those of T2, T3 and T4 (Table 2). There were no significant differences between the treatments when estimating the triglycerides and high density lipoprotein (HDL) but the diet supplemented with palm pollen had higher levels than the control. In the 5th week of the experiment blood lipids (cholesterol, triglycerides, LDL and HDL) were not significantly different among treatments. These results disagree with Al-Shammary[13] who observed the increase in blood cholesterol when the palm pollen was added to the diet of layer hens.

Table 3 indicates that in the 3rd week of the experiment ALP, AST and ALT was significantly higher in T1 than the other treatments. In the 5th week of the experiment, it was found that ALP and AST was not significantly different among the treatments, but in the 3rd treatment (T3) ALT was significantly higher ($p<0.05$) than the rest. These results agree with the

Table 2: Effect of different levels of supplementation with palm pollen on the plasma lipid profile of broilers between 3 and 5 weeks of age (Mean±SE)

	3 Week				5 Week			
Treats	Cholesterol	Triglycerides	HDL	LDL	Cholesterol	Triglycerides	HDL	LDL
T1	158.71±3.23[a]	59.74±20.80	105.24±5.22	23.99±2.34[a]	126.61±11.12	90.37±8.41	85.33±9.10	22.66±8.66
T2	98.78±8.09[b]	101.76±25.43	128.22±13.51	10.00±1.00[b]	125.99±6.18	71.91±15.49	92.25±0.87	19.50±4.33
T3	104.54±6.63[b]	109.87±20.56	119.96±15.07	12.33±2.40[b]	117.13±6.47	72.79±13.64	86.90±3.39	15.50±3.23
T4	121.82±8.48[b]	73.95±21.76	105.75±7.95	13.00±1.15[b]	115.87±5.26	73.67±16.73	92.51±1.24	8.50±1.50
	*	N.S	N.S	*	N.S	N.S	N.S	N.S

*Means with different superscripts within each column differ significantly (p< 0.05), N.S: Non-significant, HDL: High-density lipoprotein, LDL: Low-density lipoprotein T1: Control, T2: Supplemented palm pollen 200 g/100 kg diet, T3: Supplemented palm pollen 400 g/100 kg diet, T4: Supplemented palm pollen 600 g/100 kg diet

Table 3: Effect of different levels supplementation of palm pollen on the blood enzyme levels (mg/100 mL) of broilers between 3and 5 weeks of age (Mean±SE)

	3 Week			5 Week		
Treats	ALP	AST	ALT	ALP	AST	ALT
T1	595.41±134.38[a]	222.08±6.36[a]	16.99±0.04[a]	379.60±67.45	313.44±29.30	2.63±0.16[ab]
T2	403.00±26.63[ab]	151.29±12.29[b]	6.87±0.63[c]	386.15±78.58	354.36±19.96	2.59±0.73[ab]
T3	274.70±1.20[b]	182.14±24.91[ab]	9.41±0.53[b]	379.63±75.17	355.98±29.13	2.99±0.25[a]
T4	310.70±20.08[b]	194.79±20.40[ab]	8.95±0.89[b]	265.30±35.43	297.30±28.47	1.30±0.57[b]
	*	*	*	N.S	N.S	*

*Means with different superscripts within each column differ significantly (p<0.05), N.S: Non-significant, ALP: Alkaline Phosphatase, AST: Aspartate amino transferase, ALT: Alanine amino transferase, T1: Control, T2: Supplemented palm pollen 200 g/100 kg diet, T3: Supplemented palm pollen 400 g/100 kg diet, T4: Supplemented palm pollen 600 g/100 kg diet

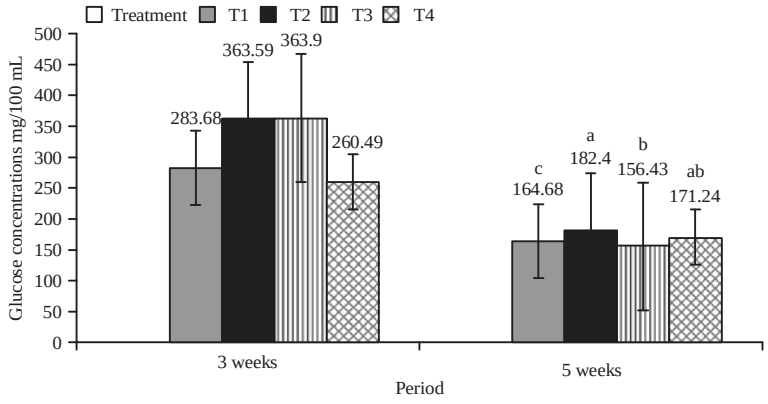

Fig. 1: Effect of different levels of supplementation with palm pollen on glucose concentrations (mg/100 mL) of broilers between 3 and 5 weeks of age (Mean±SE)

T1: Control, T2: Supplemented palm pollen 200 g/100 kg diet, T3: Supplemented palm pollen 400 g/100 kg diet,T4: Supplemented palm pollen 600 g/100 kg diet

findings of Al-Shammary[13] who observed an increase in blood enzyme when palm pollen was added to the layer hen diet.

Figure 1 shows that in the fifth week of the experiment blood sugar was significantly higher in the 2nd treatment (T2) than the others. No significant differences were noted among the treatments for this characteristic in the 3rd week of the experiment. These results agree with Al-Shammary[13] who observed an increase blood glucose level when palm pollen was added to the layer hen diets.

Figure 2 indicates that in the third week of the experiment the level of phosphorus concentration was significantly higher in T2 and T3 treatment than the other treatments, while in the 5th week of the experiment, there were no significant differences between the treatments.

Figure 3 shows that in the third week of the experiment calcium was significantly higher in T4 than the other treatments. A significant difference was noted between the treatments for this characteristic in the 5th week of the experiment.

Figure 4 indicates that in the 3rd and 5th weeks of the experiment uric acid was significantly higher in T1 than the other treatments. These results disagree with Al-Shammary[13] who observed an increase in uric acid concentrations when the palm pollen was added to the layer hen diet.

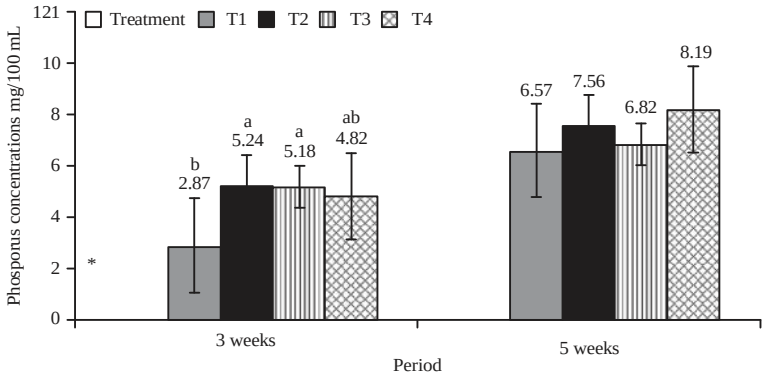

Fig. 2: Effect of different levels supplementation of palm pollen on phosphorus concentrations (mg/100 mL) of broilers between 3 and 5 weeks of age (Mean±SE)

T1: Control, T2: Supplemented palm pollen 200 g/100 kg diet, T3: Supplemented palm pollen 400 g/100 kg diet, T4: Supplemented palm pollen 600 g/100 kg diet

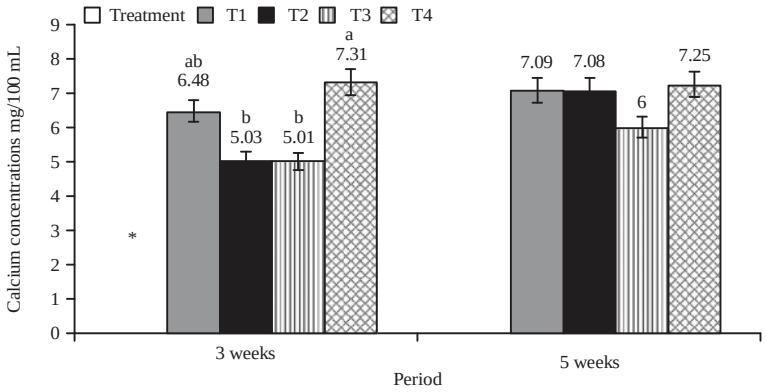

Fig. 3: Effect of different levels supplementation of palm pollen on calcium concentrations (mg/100 mL) of broilers between 3 and 5 weeks of age (Mean±SE)

T1: Control, T2: Supplemented palm pollen 200 g/100 kg diet, T3: Supplemented palm pollen 400 g/100 kg diet, T4: Supplemented palm pollen 600 g/100 kg diet

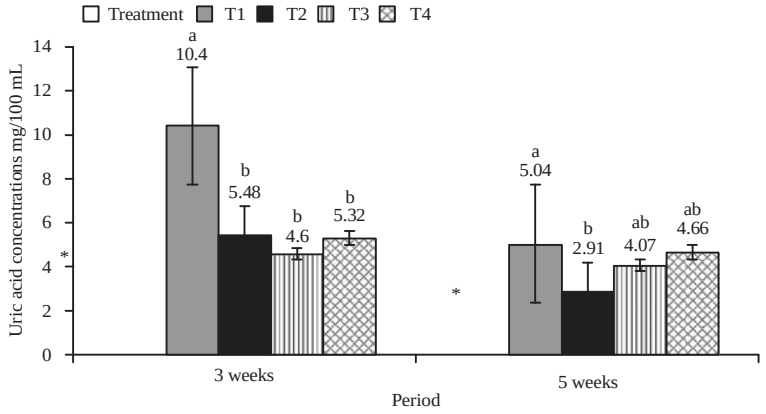

Fig. 4: Effect of different levels of supplementation with palm pollen on uric acid concentrations (mg/100 mL) of broilers between 3 and 5 weeks of age (Mean±SE)

T1: Control, T2: Supplemented palm pollen 200 g/100 kg diet, T3: Supplemented palm pollen 400 g/100 kg diet, T4: Supplemented palm pollen 600 g/100 kg diet

The cholesterol reduction in the blood of the birds may be related to the saponin in the diet supplemented with palm pollen, which is responsible for various life events. Saponins reduce the level of cholesterol in the blood through the formation of complex compounds with cholesterol in the digestive tract, leading to the inhibition of absorption of cholesterol in the intestine[14,15]. Cholesterol reduction may also be due to the inhibition of the activity of enzymes responsible for the synthesis of Cholesterol[16], because the palm pollen contains tannins and unsaturated fatty acids that discourage the enzyme β-hydroxy methyl glutaryl-CoA reductase (HMG-CoA reductase), which is important in the synthesis of cholesterol in the liver through prevention of Mevalonate formation.

Anti-oxidants in the palm pollen may be responsible for the reduction of blood enzymes. The decrease in uric acid concentration resulting from decomposition of damaged proteins[17] may be caused by the estrogen contained in palm pollen, which works to increase the base metabolic rate and thus increase the decomposition of proteins, leading to a decrease in the uric acid concentration.

CONCLUSION

Hence, it can be concluded that addition of Palm pollen to the diet of Broiler chicken, significantly improve the levels of lipids, proteins, enzymes, glucose, phosphorus, calcium and uric acid concentrations in the blood of broilers.

SIGNIFICANCE STATEMENT

This study discovers that the addition of palm pollen to the diet had a beneficial effect on broiler birds because it contains effective natural substances and some chemical compounds such as saponin, antioxidants, vitamins (A, B, C, D and E) and various mineral elements. Thus a new theory on the use of palm pollen as safe and non-toxic fodder additives to enhance the vitality, immunity and productive performance of the birds has arrived at.

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