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Article

Effect of Adding Local and Egyptian Palm Pollen (Phoenix dactylifera L.) to Diet on Some Blood Biochemical Barometers and Intestinal Flora of Broiler Roos 308

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ABSTRACT

The experiment was conducted to study the effect of adding local and Egyptian palm pollen to broiler feed on some blood biochemistry parameters and intestinal flora by using 400 broiler chicks Ross308 one-day age and divided into 8 treatments and 5 replicates. Each treatment includes 50 birds, 10 birds per replicate. Palm pollen was added to the diet from the first day till the end of the experiment (42 days). The first treatment was a control without any addition. The second and third treatments included the addition of 1 and 2 kg/ton from local palm pollen, while the fourth and fifth treatments added 1 and 2 kg/ton from Egyptian palm pollen As for the sixth treatment, the addition of 1 kg of local palm pollen/ton +1 kg of Egyptian palm pollen/ton as well as the seventh treatment 1 kg of local palm pollen/ton + 2 kg of Egyptian palm pollen/ton and the eighth was the addition of 2 kg of local palm pollen / ton+1 kg Egyptian palm pollen/ton. The experiment results showed significant differences ($p<0.05$) in the concentration of protein, albumin, globulin, glucose, Cholesterol and LDL when adding palm pollen compared to the control treatment. There was a significant increase in HDL in the treatments added with palm pollen and the activity of liver enzymes ALT and AST. There was an improvement in the antioxidant status, as there was a decrease in the levels of malondialdehyde and an increase in the levels of GSH glutathione in the palm pollen supplementation treatments compared to the control treatment. Also, a significant decrease was recorded in additional treatments in the numbers of E. coli bacteria and a significant increase in additional treatments in the numbers of Lactobacilli compared with the control treatment.

Keywords: broilers, palm pollen, antioxidants, antimicrobials

INTRODUCTION

The poultry industry is one of the quick ways to provide animal protein, which is increasingly needed due to the expanding population in the world. The expansion of the poultry industry is the only solution to bridge the gap between the need and the provision of animal protein in any developing country in the shortest possible time [1,2] Antioxidants are substances that prevent oxidation and chemical reactions that use oxygen, thus protecting the vital components in the coverings of living

cells from damage and reducing and neutralizing damage to cells caused by free radicals inside the body [3,4] The aim of adding antioxidants is not only to reduce stress but also to counteract the risks arising from the use of medicines in the poultry industry. Recently, it was found that adding natural herbals to diets could improve growth, and given the health caveats in the use of growth stimulants and animal antibiotics, there is increased interest in the use of medicinal herbs and plants to replace a successful alternative to synthetic drugs [5] In this study, palm pollen was used because it contains many nutrients distinct in its chemical composition. It includes iron, phosphorous, calcium, and vitamins A, C, B, E and D [6,7] (. The antioxidant activity of palm pollen is attributed to a wide range of phenolic compounds and contains flavonoids such as β-mirin and β-sitosterol, which act as antioxidants [8].

MATERIALS AND METHODS

In this experiment, 400 unsexed Rose308 broiler chickens were used, divided into 8 treatments and 5 replicates; each treatment included 50 birds, 10 birds per replicate, randomly distributed from the first day; the treatments were: -

T1 first treatment is the control treatment without any addition

T2, T3 second and third treatments added 1 and 2 kg/ton local palm pollen.

T4, T5 fourth and fifth treatments, adding 1 and 2 kg/ton Egyptian palm pollen.

T6 the sixth treatment addition of 1 kg of local palm pollen/ton +1 kg of Egyptian palm pollen/ton.

T7 Seventh treatment: 1 kg of local date palm pollen/ton + 2 kg of Egyptian palm pollen/ton.

T8 eighth treatment addition of 2 kg of local palm pollen / ton+1 kg of Egyptian palm pollen/ton.

Blood Collection:

Blood samples were collected from the jugular vein at the age of (42) days. 2 birds collected blood from each replicate (10 birds/treatment). Test tubes that do not contain anticoagulant were placed in the refrigerator for 12 hours and then placed in a centrifuge after blood clotting at a speed of 3000 RPM for 15 minutes to separate the serum from the cellular part. Then, serum was collected in tubes using a pipette, and the samples were saved In the freezer to conduct laboratory tests.

RESULTS

The statistical analysis results in Table (2) showed the effect of the experiment's parameters on the biochemical characteristics of blood (glucose, total protein, albumin and globulin). It was noted that there was a significant superiority ($P<0.05$), and T1 (control treatment) recorded the highest level of glucose in the blood plasma of broilers. It was also noted that the treatments T3, T6 and T8 had a significant decrease ($P<0.05$), and these treatments did not record significant differences with Transactions T2, T4, T5 and T7. The reason may be due to the presence of active compounds represented by flavonoids and saponins whose effect is similar to that of hormones, including estrogen [9]. As these steroid hormones increase the basal metabolic rate, they are anabolic hormones that increase the formation of proteins and reduce their breakdown (Sturkie, 2020). Palm pollen contains minerals, phenols, and plant estrogens, which play a vital role in managing the level of glucose in the blood.

Feed material %	Starter bush 1-10 days	Growing bush 11-24 days	Fattening diet 25-42 days
Wheat	39.29	43.68	**22.28**
yellow corn	17.31	20.12	**41.81**
Soybean meal 49	34.75	29.15	**27**
table salt	0.30	0.22	**0.22**
sunflower oil	4	4	**5**
Limestone	1	0.60	**0.69**
Di Calcium Phosphite	2.66	1.32	**2.19**
Mixed vitamins and minerals	0.10	0.10	**0.10**
Methionine	0.27	0.25	**0.21**
Lysine	0.32	0.32	**0.25**
Choline Chloride 60%		0.24	**0.25**
the total	100	100	**100**
Calculated chemical analysis (b)			
The energy represented as k/kg of feed	3000.53	3097.76	**3210.22**
Calculated crude protein%	23.67	21.75	**19.84**
methionine%	0.59	0.55	**0.49**
Lysine%	1.44	1.31	**1.16**

Table 1. Diet composition and Calculated analysis.(a) 1 kg of Vitamin and Mineral Blend Prepares Vitamin A (12,000 IU), Vitamin D3 (25,000 IU), Vitamin E (200 mg), K3 (20 mg), B1 (20 mg), B2 (50 mg), B6 (30 mg), B12 (150 mcg), folic acid (10 mg), niacin (300 mg), calcium (8%), manganese (400 mg), zinc (150 mg), iron (53 mg), copper (43 mg), choline (40 mg).(b) According to the chemical composition of the feed materials, based on what was reported in the US National Research Council (NRC) (1994).

It was also noted that the total protein level in the blood plasma was significantly superior (P<0.05) in favor of treatment T3 compared with treatments T2, T4, T5, and T7, and there were no significant differences with treatment T8. It was also noted that treatment T1 recorded a significant decrease. The increase in total protein concentration in the blood plasma may be due to the presence of many types of amino acids that participate in the formation of proteins [13] And the presence of substances that help increase the representation of proteins. The average concentration of total protein in the blood plasma of birds ranges between 3-6 g/100 ml [14] The results showed the effect of the different treatments on the albumin level, as it was found that the T3 treatment had a significant (P<0.05) superiority. It achieved 3.11 g/100 ml compared to the rest of the experimental treatments, as was noted in the T1 treatment. The lowest values were recorded compared with T2, T4, T5, T7 and T8. Albumin is the main part of the total protein in the blood as the liver synthesizes it. [15] indicated that globulin, including antibodies present in the blood plasma, is an indicator of immunity and indicates the extent of liver tissue damage through the results obtained. It was found that treatment T3, compared to treatments T1, T2 T4, T5, and T7, did not differ significantly from treatment T8, which is the reason for the superiority of treatment T3.

Qualities				
treatment	***Glucose (mg/dL)***	*total protein)g/100ml(*	*Albumin (g/100ml(*	***Globulin (g/100ml)***
T1	**150.88±5.39** *a*	*0.08±3.***94** *e*	*2.***89***±0.03 e*	***1.05±0.05 d***
T2	*147.88±6.28ab*	*0.07±***4.0***6 de*	*2.***94***±0.03 de*	***1.11±0.05 cd***
T3	*129.94±1.53c*	*0.07±4.***6***0 a*	*3.22±0.05 a*	***1.37±0.03 a***
T4	*144.72±3.32 abc*	*0.09±***4.0***8 cde*	*2.97±0.04 CDE*	***1.11±0.06 cd***
T5	*147.63±6.23ab*	*0.07±4.19 bcd*	*3.02±0.03 CBD*	***1.17±0.03 cd***
T6	*130.30±3.97 c*	*0.02±4.26 bcd*	*3.06±0.02 bcd*	***1.20±0.02 bc***
T7	*132.95±6.45bc*	*0.06±4.30 bc*	*3.09±0.03 bc*	***1.21±0.04***
T8	*131.82±4.39c*	*0.07± 4.41 ab*	*3.10±0.04b*	***1.31±0.03 ab***

Table 2. Effect of adding different levels of local and Egyptian palm pollen to the feed on some blood chemical parameters (total protein, albumin, globulin mg/100ml and glucose mg/dL for rose 308 broilers (mean ± standard error). *Means with different letters significantly different at P<0.05. ** Treatments T1, T2, T3, T4, T5, T6, T7 and T8 Addition of palm pollen (0, 1gm of local palm pollen/kg feed, 2gm palm pollen local/kg feed, 1g Egyptian palm pollen/kg feed, 2gm pollen Egyptian palm pollen/kg feed, 1g local palm pollen/kg feed +1g Egyptian palm pollen/kg feed, 1g local palm pollen/kg feed +2g Egyptian palm pollen/kg feed, 2g local palm pollen/kg feed +1g Egyptian palm pollen/kg feed /kg feed) respectively.

The results of Table (3) indicate the effect of adding palm pollen to the feed on the concentration of cholesterol, triglycerides, high-density lipoproteins (HDL), low-density lipoproteins (LDL) and very low-density lipoproteins (VLDL) for broilers at 42 days of age from start the study. The results indicated that there was a significant decrease in the level of cholesterol in the blood plasma of broilers for the experimental treatments compared to the control treatment, as the averages reached (203.56, 195.68, 184.18, 199.47, 196.66, 187.21, 189.67 and 184.31 mg/dL blood serum), respectively. As for the level of triglycerides, a significant decrease was observed in favor of treatments T3 and T7, reaching 161.80 and 163.72 mg/dL, compared to 189.85 mg/dL for the control treatment. In contrast, the treatments T2, T4, T5, T6 and T8 did not differ significantly from each other, reaching 183.34, 179.05, 179.65, 184.52, and 170.56 mg/dL. As for the level of high-density lipoprotein (HDL), it showed significant superiority in favor of treatments T3, T7 and T8, as it reached 73.05, 74.51 and 72.96 mg/dL compared to 54.46 mg/dL for the control treatment, while the treatments T4 and T5 did not differ from each other significantly, reaching 61.86 and 59 .27 mg/dL, As for the level of very low-density lipoproteins (VLDL), we notice a significant decrease in favor of treatments T3 and T7, which amounted to 32.36 and 32.74 mg/dL, compared with the T1 control treatment, which recorded the highest value of 37.97 mg/dL. In contrast, treatments T2, T4, T5, T6 and T8 did not. Significantly different from each other, it reached 36.66, 35.81, 35.93, 36.90 and 34.11 mg/dl.

The decrease in palm pollen addition treatments may be due to the role of palm pollen in stimulating the formation of hormones and, thus, increased demand for cholesterol to make hormones. Hence, the level of cholesterol concentration in the blood serum decreases. They contain active compounds with common cholester-

ol-lowering benefits and work to lower cholesterol by reducing the production of Acetyl CoA, which is the basis for cholesterol synthesis. [20] Palm pollen components may have a role in increasing the effectiveness of the enzymes responsible for the manufacture of cholesterol in the liver.

The phenolic compounds in palm pollen are highly effective antioxidants that protect essential metabolites such as low-density lipoprotein from various oxidative factors through free radical scavenging (Haraguchi et al., 1998). Phenolic compounds are effective as antioxidants through their ability to inhibit lipid oxidation [22] In the normal case, AST and ALT enzymes are found in the cells of different tissues of the body, but when cells break down in a particular tissue, these enzymes enter the bloodstream and thus its level rises, and this gives evidence of a defect, either due to disease, bruising, or otherwise [23] If the level of AST and ALT in the blood serum remains the same, it is an indication of the health status of the various body tissues in general.

	Qualities				
treatment	***Cholesterol (mg/dL)***	***Triglyceride (mg/dL)***	***High-density lipoproteins (mg/dL)***	***Low-density lipoproteins***	***Very low-density lipoproteins (mg/dL)***
T1	*203.56±**2.46** a*	*189.85±7.49 a*	*54.46±2.22 c*	*111.13±**2.82** a*	***37.97±1.49 a***
T2	*195.68±5.35 abc*	*183.34±9.04 ab*	*58.93±2.62 bc*	*100.08±5.04 a*	***36.66±1.80 ab***
T3	*184.18±3.85 d*	*161.80±4.95 b*	*73.05±2.36 a*	***78.77±4.78** b*	***32.36±0.99 b***
T4	*199.47±3.87 ab*	*179.05±7.23 ab*	*61.86±5.52 bc*	*101.80±4.15 a*	***35.81±1.44 ab***
T5	*196.66±2.29 abc*	*179.65±6.23 ab*	*59.27±4.11 bc*	*101.46±4.52 a*	***35.93±1.24 ab***
T6	*187.21±2.83 cd*	*184.52±7.24 ab*	*67.69±4.63 ab*	*82.61±4.90 b*	***36.90±1.24 b***
T7	*189.67±3.62 CBD*	*163.72±4.19 b*	*74.51±3.69 a*	*82.41±3.78 b*	***32.74±0.83 b***
T8	*184.31±1.85 d*	*170.56±3.73 ab*	*72.96±1.93 a*	*77.23±2.66 b*	***34.11±0.74 ab***

Table 3. Effect of adding different levels of local and Egyptian palm pollen to the feed on the serum lipid profile of Rose 308 broilers (mean ± standard error). *Means with different letters significantly different at P<0.05. Treatments T1, T2, T3, T4, T5, T6, T7 and T8 Addition of palm pollen (0, 1gm of local palm pollen/kg feed, 2gm palm pollen local/kg feed, 1g Egyptian palm pollen/kg feed, 2gm pollen Egyptian palm pollen/kg feed, 1g local palm pollen/kg feed +1g Egyptian palm pollen/kg feed, 1g local palm pollen/kg feed +2g Egyptian palm pollen/kg feed, 2g local palm pollen/kg feed +1g Egyptian palm pollen/kg feed /kg feed) respectively.**

It is evident from Table (4) that there are significant differences ($P < 0.05$) between the treatments to which palm pollen was added and the control treatment in AST enzyme. We notice a significant decrease for the treatments of palm pollen grains T3 and T8, which amounted to 27.93 and 28.47 IU / L compared to 33.76 IU / L for the control treatment, As for treatments T2 and T4, they did not differ significantly from each other, as they reached 31.81 and 32.26 IU/L, respectively, and treatments T5, T6 and T7 did not differ significantly from each other, reaching 30.70,

30.76 and 29.99 IU/L, respectively. As for the ALT enzyme, we noticed a significant decrease in favor of the T3 treatment, which amounted to 7.39 international units/liter compared to 9.42 international units/liter for the control treatment. Also, treatments T6 and T7 did not differ significantly from each other, reaching 29.99 IU/L. The reason for the decrease may be due to palm pollen containing active substances that contain antioxidants, the protection of unsaturated fatty acids in the cell membranes from oxidation processes, and these membranes retaining the selective permeability, and the cell retaining their contents and not leaching out of the cell body [24] It may be because these enzymes AST and ALT work to increase the transfer of the amino group from the amino acid from the alpha to the ketogenic acids that serve as an energy source, so that the AST enzyme stimulates the transfer of the amino group from the amino acid to produce energy in the mitochondria (Stryer, 2000), The enzyme ALT activates the amino acid alanine and transfers it to pyruvic acid, while AST activates the transfer of the amino group from aspartic acid to oxaloacetic acid [25]r enzymes (AST, ALT) in palm pollen treatments can be attributed to the antioxidant properties of palm pollen. Studies have confirmed that phenolic compounds in palm pollen can inhibit harmful oxidative free radicals [26].

treatment	AST	ALT
T1	33.76 ±1.18 a	**9.42±0.11 a**
T2	31.81 ±0.81 ab	**8.37±0.20 b**
T3	27.93±0.71 c	**7.39±0.26 d**
T4	32.26±0.80 ab	**8.43±0.19 b**
T5	30.70±1.63 bc	**8.35±0.17 b**
T6	30.76±0.86 bc	**8.07±0.20 bc**
T7	29.99±0.67 bc	**8.01±0.21 bc**
T8	28.47±0.54 c	**7.60±0.14 cd**

Table 4. The effect of adding different levels of local and Egyptian palm pollen to the feed on the amino group transfer enzymes (AST, ALT) in the serum of Rose 308 broilers (mean ± standard error). *Means with different letters significantly different at P<0.05. ** Treatments T1, T2, T3, T4, T5, T6, T7 and T8 Addition of palm pollen (0, 1gm of local palm pollen/kg feed, 2gm palm pollen local/kg feed, 1g Egyptian palm pollen/kg feed, 2gm pollen Egyptian palm pollen/kg feed, 1g local palm pollen/kg feed +1g Egyptian palm pollen/kg feed, 1g local palm pollen/kg feed +2g Egyptian palm pollen/kg feed, 2g local palm pollen/kg feed +1g Egyptian palm pollen/kg feed /kg feed) respectively.

We notice in Table (5) that there is a significant increase in the level omalondialdehyde MDA in favor of the control treatment, which scored 0.889 compared to the treatments of the addition of palm pollen, which recorded 0.845, 0.771, 0.806, 0.805, 0.788, 0.785, 0.784 for the treatments T2, T3, T4, T5, T6, T7, T8. As for the level of GSH glutathione, we notice a significant increase for all treatments to which palm pollen was added, as it recorded 236.7, 270.6, 229.1, 232.5, 260.5, 265.1, 267.5 for treatments T2, T3, T4, T5, T6, T7, T8, respectively compared to the control treatment that The lowest rate was 203.9.

treatment	Malone Didehyde MDA Mmol / l	GSH. Glutathione Mmol / l
T1	0.889±0.00 a	**203.9 ±7.8 c**
T2	0.845 ±0.00 b	**236.7 ± 8.2 b**
T3	0.771 ±0.00 d	**270.6 ±6.3 a**
T4	0.806 ±0.00 c	**229.1 ±8.7 b**
T5	0.805 ±0.01 c	**232.5 ±3.8 b**
T6	0.788 ±0.01 cd	**260.5 ±6.3 a**
T7	0.785 ±0.00 cd	**265.1 ± 6.1 a**
T8	0.784 ±0.00 cd	**267.5 ± 6.3 a**

Table 5. The effect of adding different levels of local and Egyptian palm pollen to the feed on the concentration of MDA, glutathione, MDA and GSH in the serum of rose 308 broilers (mean ± standard error). *Means with different letters significantly different at P<0.05. Treatments T1, T2, T3, T4, T5, T6, T7 and T8 Addition of palm pollen (0, 1gm of local palm pollen/kg feed, 2gm palm pollen local/kg feed, 1g Egyptian palm pollen/kg feed, 2gm pollen Egyptian palm pollen/kg feed, 1g local palm pollen/kg feed +1g Egyptian palm pollen/kg feed, 1g local palm pollen/kg feed +2g Egyptian palm pollen/kg feed, 2g local palm pollen/kg feed +1g Egyptian palm pollen/kg feed /kg feed) respectively.**

Table (6) shows the results of the effect of adding different levels of local and Egyptian palm pollen to broilers and their effect on the numbers of lactic acid bacteria, Total bacteria and coliform bacteria in the jejunum area of the small intestine at the age of 6 weeks. The results showed significant differences (p>0.01) between the experiment treatments for the numbers of Lactic Acid Bacteria in the jejunum area. It was noted that there was a highly significant (P≤0.01) superiority in favor of treatments T3, T4, T5 and T6 compared to the rest of the experimental treatments. In contrast, significant superiority was observed in favor of treatments T7 and T8 over treatments T1 and T2.

treatment	lactic acid bacteria	total aerobic bacteria	E.Coli bacteria
T1	5.55 ± 0.28 c	8.78 ± 0.33 a	**6.58 ± 0.22 a**
T2	5.78 ± 0.23 c	7.25 ± 0.14 b	**5.75 ± 0.44 bc**
T3	6.78 ± 0.32 a	6.11 ± 0.11 c	**5.21 ± 0.17 c**
T4	6.67 ± 0.17 a	6.33 ± 0.13 c	**5.45 ± 0.32 c**
T5	6.78 ± 0.32 a	6.67 ± 0.11 c	**5.75 ± 0.17 bc**
T6	6.67 ± 0.17 a	6.59 ± 0.13 c	**5.45 ± 0.32 c**
T7	6.23 ± 0.26 b	6.89 ± 0.12 c	**5.88 ± 0.21 bc**
T8	6.54 ± 0.11 ab	6.34 ± 0.21 c	**5.88 ± 0.12 b**
morale level	0.01>	0.01>	**0.05>**

Table 6. The effect of adding different levels of local and Egyptian palm pollen to the feed on the numbers of lactic acid bacteria total aerobic bacteria, and E. coli bacteria of rose 308 broilers (mean ± standard error). *Means with different letters significantly different at P<0.05. ** Treatments T1, T2, T3, T4, T5, T6, T7 and T8 Addition of palm pollen (0, 1gm of local palm pollen/kg feed, 2gm palm pollen local/kg feed, 1g Egyptian palm pollen/kg feed, 2gm pollen Egyptian palm pollen/kg feed, 1g local palm pollen/kg feed +1g Egyptian palm pollen/kg feed, 1g local palm pollen/kg feed +2g Egyptian palm pollen/kg feed, 2g local palm pollen/kg feed +1g Egyptian palm pollen/kg feed /kg feed) respectively.

DISCUSSION

Magnesium also plays a key role in regulating insulin action and glucose absorption. Chromium also strengthens the action of insulin, stimulates selenium uptake of glucose, and regulates the breakdown of pentose phosphate pathways, which leads to a decrease in blood glucose levels [9,10]

Palm pollen contains what is known as (IPF) Insulin Polyphenol Factor, insulin-stimulating factors that play an important role in lowering the level of glucose in the blood [11] .[12] indicated that palm pollen contains substances that have a role in increasing the activity of enzymes responsible for glycogen synthesis, such as glycogen synthetase enzyme, and inhibiting the activity of enzymes such as glycogen phosphorylase, which work on glycogenolysis.

The superiority of T3 treatment may be due to the role of carotenoids and vitamin A in palm pollen, which enhance the immune response. They act as antioxidants and protect against catabolic reactions in the body by acting as physiological antioxidants [16] and inhibiting the breakdown of DNA and proteins in the body [17]. The role of vitamin C in palm pollen, which plays a role in promoting general health and stimulating lymphocytes to produce antibodies [1]

[18] explained that lymphocytes are responsible for the production of globulin, an indicator of immune system activation. The increase in serum globulin content may be due to the immunostimulant effect of palm pollen. Moreover, these results indicate an improvement in the growth rate of broilers. The results agree with those of [19] who treated broiler diets with cinnamon, cumin and ginger as a natural antioxidant containing flavonoids as a major component, and concluded that total protein and globulin were increased.

The reason for the decrease in palm pollen addition treatments may be that flavonoids can reduce acetyl CoA synthesis by delaying the activity of cholesterol transferase (ACAT) in HepG2 cells, which results from hepatic production of apo-B containing lipoproteins, thus reducing the concentration of LDL in the blood [21].

However, the reason for the low levels of liver enzymes may be due to the antioxidant properties of the plant palm pollen and other elements such as vitamin E or minerals such as zinc, which have a regulatory role in maintaining the liver and improving its functions, As well as the role of vitamin E and zinc, which regulate many enzymes necessary for the metabolism for growth and production [6]

In addition, flavonoids may contribute as a cofactor to their ability to protect the liver by inhibiting the aromatase enzyme, which protects the antioxidant defense mechanism [27.]

The measurement of the number of Lactic Acid Bacteria and E.coli bacteria in the intestines of birds is to identify the microbial content in the bird's intestinal tract and the state of microbial balance inside the intestine. This is because E.Coli is an important indicator of the intestinal content of pathogenic bacteria, while Lactic Acid Bacteria is an important indicator of beneficial bacteria that have an important role in the competitive exclusion of many types of pathogenic intestinal bacteria [2]

The low PH in the gut inhibits the intestinal bacteria, reducing their metabolic needs, thus providing a suitable growth environment for beneficial microorganisms (lactobacilli). Thus, it increases the provision of nutrients to the bird, and this leads to a decrease in the toxic metabolic products of bacteria due to a decrease in bacterial fermentation and then an improvement in the birds' productive performance [21]

The compounds in palm pollen are anti-bacterial compounds that contain flavonoids (rutin), which have an important role in reducing E.coli colonies by breaking down the harmful bacterial cell wall, coagulating its protein and changing the permeability of its cytoplasmic membrane, which inhibits its vital activity, and

then the species decreases. Harmful bacteria such as E.coli in the gut increase their absorption of nutrients and their transport to the liver to increase metabolism and building processes [22].

CONCLUSIONS

The current study shows a decrease in the number of coliform bacteria and the number of total aerobic bacteria and an increase in the number of lactobacilli (Table 5). When palm pollen is added to the feed, as the active compounds in palm pollen, such as flavonoids, have an acidic character, they change the PH value, which in turn lowers the PH of the intestine.

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