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The Effects of Rosemary (Rosemarinus Afficinalis) Pawder and Thyme (Thymus Vulgaris) Powder on Performance, Hematological, Biochemical Parameters of Male Quails

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Annotation: This study was conducted at the poultry farm of the Animal Production Department, College of Agriculture, University of Kirkuk, during the period from 02/25/2023 to 05/25/2023, to determine the effect of adding rosemary powder on the physiological and biochemical characteristics of blood and the antioxidant status in the blood serum of female quails. 64 male Japanese quails, eight weeks old, were used. The birds were randomly distributed into four treatments, each treatment containing four replicates, each replicate containing four male quails. They were then housed in battery cages, each cage consisting of 5 floors, each floor consisting of 3 cages, with four males inside each cage. The birds were fed ad libitum, and the treatments were distributed as follows: Treatment 1 was a control (no supplement), Treatment 2 added 0.50% rosemary powder, Treatment 3 added 0.50% thyme powder, and Treatment 4 added 0.50% rosemary powder + 0.50% thyme

powder. The statistical analysis results showed that:There is a significant improvement in the levels of cholesterol TG -HDL LDL -VLDL, as well as URIC ACID-KREATINE and blood parameters by adding rosemary powder and thyme powder together or alone to the rations of male quails.

Keywords: Rosemary, Thyme, Hematological, Biochemical.

Introduction

Medicinal plants now play a big part in the manufacturing of industrial goods. To produce a few of the main chemical substances with therapeutic qualities that are used in the pharmaceutical business, including flavonoids, glycosides, polyphenols, and saponins (AL-Tamimy, et al., 2024).The World Health Organization estimates that 80% of therapeutic plants have therapeutic effects; most of these benefits stem from the extracts' or components' actions as growth promoters (Abd El-Latif, et al., 2013) (Abdulkarimi, et al., 2011) , antibacterial,and antimicrobial substances. antioxidants(Ademola, et al., 2011) (Ahmed& Aziz,2023)], and antifungal agents (Abdullah, et al., 2023) Additionally, it produces bile and promotes its secretion, improves the function of the liver, small intestine, and pancreas, raises the production of digestive enzymes, decreases blood fat levels, Additionally, it boosts the immunological system(AL- Azzami & AL-Dhanki,2020). Because of this, the practice of using medicinal herbs in animal diets—both as alcoholic and aqueous extracts meant for animal consumption—has spread, which has increased the production of animal foods and an improvement in human health through improved dietary patterns and greater animal product production . The positive effects of herb extracts were due to their anthelmintic qualities, immune system activation, digestibility, and feed intake increase. Antibiotic use is illegal in many parts of the world. Additionally, because of their immunostimulant properties, plant essential oils have been shown to inhibit infections. oxidative and antibacterial properties(AL- Azzami & AL-Dhanki,2020).The fragrant plant rosemary (Rosemarinus afficinalis) is one of the medicinal plants that is commonly used as a flavoring agent and spice in food preparation.(Alagawany& Abd El-Hack, 2015). Carnosal, carnosic acid, caffeic acid, and its derivatives, including rosmarinic acid, are the main components of rosemary. Because of its strong antioxidant properties, rosemary and its compounds have been shown to have therapeutic promise in the treatment of a wide range of illnesses (Al-Dadhli, et al., 2020) .Thyme (Thymus vulgaris L.) is a member of the Lamiaceae family of fragrant plants. As a medicinal and pharmaceutical ingredient, thyme is receiving a lot of interest worldwide. The three main bioactive components of this aromatic plant, paracymene, thymol, and carvacrol, are said to be in charge of most of the pharmacological effects of thyme(Al- Dahal & Farran, et al., 2011). Active ingredients like carvacrol and thymol exhibit antiviral, antibacterial, antioxidant, and aroma-regulating properties. According to certain research, adding thyme to chicken feed improves growth performance (Ifabiyi, et al., 2022) . To date, tAhere are only a few scientific reports on the effect of dietary supplements of rosemary (Rosemarinus afficinalis) and thyme (Thymus vulgaris) powder on the performance, hematological, and biochemical parameters of male quails. Furthermore, there is limited information available on the combined use of rosemary and thyme powders in quail diets. Therefore, this study aimed to investigate the effect of rosemary and thyme powders on the performance, hematological, and biochemical parameters of male

quails

Materials and Methods:

This study was conducted in one of the poultry farms affiliated to (the College of Agriculture - University of Kirkuk) for a period of 25/2/2023 to 25/5/2023. This research aims to know the effect of adding rosemary powder on (the physiological and biochemical characteristics of blood and the status of antioxidants in the blood serum of male quails). 64 male Japanese quails at the age of eight weeks were used. The birds were randomly distributed into four treatments, each treatment had four replicates and each replicate had four male Japanese quails. The birds were transferred to five-storey batteries. It was designed for breeding these birds and the dimensions of each cage were (40 x 30 x 20) cm, made of plastic mesh.

Experimental design:

The Four experimental treatments as follow:

First treatment- T1 = basal diet

Second treatment- T2 = basal diet with (0.5%) of Rosemary powder

Third treatment- T3 = basal diet with (0.5%) of thyme powder

Fourth treatment -T4 = basal diet with with (0.5%) of Rosemary powder + (0.5%) of thyme powder.

Table 1. Ingredients and chemical composition of the experimental diets

Ingredient	Experiment diet composition
Corn	32.80
Full fat soybean	21.12
Dry soybean	16.51
Wheat	16.05
Soybean fat	5.50
Poultry meal	3.50
Corn glutein	1.51
Meat and bone meal	2.64
DCP (Dicalcium phosphate	0.50
Methionine	0.25
Vitamin mineral premix	0.50
Salt	0.16
Sodium bicarbonate	0.16
Marble	0.15
Antitoxin	0.11
Choline chloride	0.08
Threonine	0.07
Lysine	0.05
TOTAL	**100.00**

Blood Biochemical Parameters: Total protein (TP), albumin (Alb), uric acid (UA), triglycerides (TG), and the serum enzymatic activity of alanine amino transferase (ALT) and aspartate amino transferase (AST) were measured in serum samples.

Low-density lipoprotein (LDL), high-density lipoprotein (HDL), and cholesterol (TC).

Following the manufacturer's directions, a spectrophotometer was used to measure each of these parameters. The albumin to globulin ratio (A/G) was derived by deducting the albumin

concentration from the total protein, which yielded the globulin concentration (Glob) in serum.

studied characteristics:

1- blood lipids

2- Liver enzymes

3- GLOCOSE-PROTEN –ALBOMEN-URIC ACID-KHRATEN

4- Hematological Parameters:

According to standard avian hematological techniques, hematological parameters including packe d cell volume (PCV), hemoglobin (Hb), red blood cell count (RBCs), total white blood cell (WBC s), and differential leukocytic counts were evaluated. { **Feldman, Zinkl et al., 2000** }.

Statistical Analysis:

The Duncan multiple range test was used to compare average means [**Duncan.,1995**]. and the statistical program (SAS){ **SAS. 2004**} was used to implement the completely randomized design-CRD in accordance with the following mathematical Model : Yij = μ + Ti + eij.

Results:

blood lipids:

We note from Table 1 that the control treatment(basal diet) outperformed the rest of the treatments in the cholesterol and LDL traits,(214,97.35) respectively. In the HDL trait, all treatments outperformed the control treatment,(115.345, 115.145 ,121.42) respectively. The fourth treatment basal diet with with (0.5%) of Rosemary powder + (0.5%) of thyme powder. outperformed the rest of the treatments in the TG and VLDL traits, (167. 93 , 33.586) respectively.

Table (2): The effect of Rosemary and thyme powder on blood lipids of male quails.

Treatment	*Cholesterol (mg/dl)*	*TG (mg/dl)*	*HDL (mg/dl)*	*LDL (mg/dl)*	*VLDL (mg/dl)*
T1	**214±3.56 a**	**96.275±2.60 d**	**89.34±2.21 b**	**97.35±3.87 a**	**19.255±0.05 c**
T2	**209.5±1.59 ab**	**112.175±1.22 c**	**115.345±2.85 a**	**71.305±4.19 b**	**22.435±0.02 bc**
T3	**203.5±2.31 bc**	**152.32±2.56 b**	**115.145±1.57 a**	**64±3.91 bc**	**30.464±0.03 b**
T4	**197±4.02 c**	**167.93±1.77 a**	**121.42±2.66 a**	**57±4.87 c**	**33.586±0.02 a**

The different letters within one column indicate significant differences between the parameters ($p < 0.05$)

Liver enzymes:

We note fromTable 2 The AST trait showed that the control treatment was superior to the other treatments, reaching 385.29, and that there was no significant difference between the T4 and T3 therapies, which reached (352.62, 364.28). We see that there was no discernible improvement in the ALT and ALP traits when compared to the control therapy.

Table (3): The effect of Rosemary and thyme powder on Liver enzymes of male quails.

Treatment	*AST U/L*	*ALT U/L*	*ALP U/L*
T1	**385.29±3.67 a**	**64.66±2.53 a**	**576.85± 0.54 a**
T2	**352.62±1.88 abc**	**65.14±2.71 a**	**475.4±0.35 a**

T3	**364.28±1.76 ab**	**63.42±2.82 a**	**506.75±0.63 a**
T4	**33.75±2.63 d**	**65.28±2.56 a**	**447.4±0.58 a**

The different letters within one column indicate significant differences between the parameters ($p < 0.05$)

GLOCOSE - PROTEN – ALBOMEN - URIC ACID - KHRATEN :

We note from Table 3 that the control basal diet and second treatments. basal diet with (0.5%) of Rosemary powder , significantly outperformed the other treatments in the uric acid trait, which reached (5.15, 4.91), respectively. In the creatine trait, the third treatment ,basal diet with (0.5%) of thyme powder outperformed the other treatments, with a value of 0.60. We note that the supplementary treatments did not show any significant superiority compared to the control treatment in the other traits.

Table (4): The effect of Rosemary and thyme powder on (GLOCOSE-PROTEN – ALBOMEN-URIC ACID-KREATINE) of male quails.

Treatment	*GLUCOSE (mg/dl)*	*PROTEN (mg /dL)*	*ALBOMEN(mg /dL)*	*URIC ACID(mg/dl)*	*KREATINE*
T1	**335.15±6.73 a**	**2.565±0.76 a**	**1.05±1.62 a**	**5.15±0.05 a**	**0.37± 0.78 ab**
T2	**352.71 ±6.69 a**	**2.96±0.39 a**	**1.125±0.88 a**	**4.91±0.88 a**	**0.32±0.97 b**
T3	**351.5±7.32 a**	**2.86 ±0.53 a**	**1.04±0.40 a**	**4.10±0.50 ab**	**0.60±1.02 a**
T4	**353.455±6.74 a**	**2.895±0.88 a**	**1.03±0.50 a**	**3.26±0.40 ab**	**0.47± 0.67 ab**

The different letters within one column indicate significant differences between the parameters ($p < 0.05$)

Hematological Parameters:

We note from Table 4 that the third treatment basal diet with (0.5%) of thyme powder outperformed the rest of the treatments in the PCV and HB traits with a rate of (40.315, 12.76) respectively, and the control treatment(basal diet) fared better than the remaining therapies. in lymphocytes with a value of (64.35), and in the WBC_S trait the third(basal diet with(0.5%) of thyme powder and fourth basal diet with with 0.5% of Rosemary powder + (0.5%) of thyme powder. treatments outperformed with a value of (30.5, 32.7) respectively. It was found that in the three characteristics (Hetrophil -H/L- RBC), The control therapy and the additional treatments did not differ significantly.

He also noted in Study (4)that hematological parameters resulted in a notable rise in the amount of packed cells in the rosemary-treated groups, as well as mean values for hemoglobin, total white blood cell count, and lymphocyte percentage.

Table (5): The effect of Rosemary and thyme powder on Hematological Parameters of male quails.

Treatment	*PCV(%)*	*HB (G/DL)*	*Hetrophil (%)*	*Lymphocyt(%)*	*H/L ratio*	*RBCs (x10 / µl)*	*WBCs (x10 / µl)*
T1	**40.22±0.55 c**	**12.94±0.15 b**	**35.685±0.71 a**	**64.35±0.89 a**	**0.55±0.01 a**	**2.53±0.16 a**	**19.35±1.09 c**
T2	**40.55±0.55 b**	**12.65 0.47 ± ab**	**40.25±1.64 a**	**61.2±1.22 c**	**0.65±0.03 a**	**2.58±0.11 a**	**26.15±2.00 b**
T3	**40.315±2.07 a**	**12.76 2.04 ± a**	**37.6±1.41 a**	**62.95±2.07 b**	**0.59±0.02 a**	**2.545±0.30 a**	**30.5±1.7 a**
T4	**39.85±1.52 bc**	**12.35 ±1.16 a**	**40.4±2.07 a**	**59.65±1.48 bc**	**0.67±0.03 a**	**2.54±0.11 a**	**32.7±2.28 a**

The different letters within one column indicate significant differences between the parameters ($p < 0.05$)

Discussions:

Table 1 showed (That cholesterol and LDL) levels in male quails were significantly decreased ($p \leq 0.05$) in the thyme and rosemary diets, while HDL levels in male quails were significantly increased ($p \leq 0.05$). The present outcomes are in line with those of (Rostami, et al., 2012), who found that adding thyme to the feed significantly reduced the concentrations of (triglycerides and total cholesterol) in the serum of Japanese quails. (Ali, 2014) discovered that supplementing broiler feed with thyme leaf powder at (0.5%, 1%, or 1.5%) reduced cholesterol levels. (Khaksar, et al., 2012) found that Japanese When thyme essential oil was added to their diet, quails showed decreased serum triglyceride and levels of total cholesterol in relation to the control group. A study found that adding thyme reduced serum cholesterol levels., and blood triglyceride levels decreased significantly with the addition of both thyme and rosemary(T. Cimrin . 2019). In Study (Abd El-Latif et al., 2013), major changes in blood biochemistry were noted, Rosemary and garlic oil supplements also increased levels of low-density lipoprotein (LDL), high-density lipoprotein (HDL), total cholesterol, and triglycerides in broiler serum. and significant decrease in serum AST activity in the garlic-treated groups. As confirmed in study (Delman et al, 2022), when thyme was added, the levels of cholesterol and triglycerides in the blood serum of both males and females dropped considerably ($p \leq 0.05$) in the treatment with thyme added. The level of Both males and females saw a significant ($p \leq 0.05$) rise in high-density lipoprotein (HDL). In both boys and females, the amount of low-density lipoprotein (LDL) dropped dramatically ($p \leq 0.05$). (Abd El-Hack & Alagawany, 2015) additionally noted that adding 3 and 6 grams of thyme to the food of laying hens decreased blood triglycerides and total cholesterol levels, and that the more thyme added, the lower LDL cholesterol. Similarly, (Rahimi, et al., 2011) claimed that adding thyme to the food of laying hens resulted in a significant decrease in blood triglyceride, total cholesterol, and LDL-cholesterol concentrations. According to other research, the serum lipid profile was unaffected by taking supplements containing rosemary powder or essential oil. (Abd El-Hack & Alagawany, 2015) (. Çimrin, & Demirel., 2016) (Ciftci, et al., 2013) claimed that the 250 mg/kg rosemary oil supplement had no effect on the levels of triglycerides, total cholesterol, HDL cholesterol, or LDL cholesterol. discovered that Japanese quail fed a diet enriched with thyme essential oil had lower levels of total cholesterol and blood triglycerides than control birds. Unlike the control group, however, (Sengul, et al., 2008) found that administering diets containing thyme extracts had no impact on blood plasma cholesterol, triglycerides, HDL, or LDL levels. These

findings are in line with (Mansoub & Myandoab 2011) who found that adding thyme products to laying hen diets significantly reduced levels of LDL cholesterol, total cholesterol, and blood triglycerides. The lipid profile improvement could be the result of thymol's ability to promote lipase and bile synthesis, resulting in better lipid digestion (Hernandez, et al., 2004). Thymol, is thought to impact gastrointestinal tract function by boosting Pancreatic enzymes like trypsin, chymotrypsin, and lipase, as well as salivary amylase and bile salt production (. Platel, & Srinivasan., 2004). Thyme's hypocholesterolemic and antilipidemic impacts on blood characteristics are thought to be by preventing the activity of hydroxylmethylglutaryl- reducing gastrointestinal fat absorption, gluconeogenesis through lipid catabolism, or CoA reductase (the enzyme that limits the rate of cholesterol production). (Abdulkarimi, R., et al., 2011). Thyme's antilipidemic and hypocholesterolemic benefits in poultry have been proven in several scientific studies (Tiihonen, K., et al., 2010) and (Dahal, & Farran., 2011). They did, however, show that rosemary leaves and essential oils differed in their ability to lower serum total cholesterol levels, with the former lowering the latter. It should be mentioned that the total phenol content of rosemary extract, essential oil, and leaves varies (Ciftci, et al., 2013), has discovered that, as compared to the control group, the diet containing 250 ppm rosemary oil had no discernible effect on LDL, HDL, cholesterol, or triglycerides. (. Alagawany. & Abd El-Hack., 2015), concluded that additives have no effect on total cholesterol, one blood metric. According to the results of the study, a dose of 200 mg/kg of rosemary extract raises the triglyceride level while numerically lowering the serum cholesterol and LDL cholesterol levels in a statistically meaningful way. However, despite a numerical increase in HDL cholesterol, it is not considered significant (Belenli, et al., 2015), found that the addition of rosemary to broiler feeds reduced the amount of lipids and cholesterol. (Bugdayci & Ergun 2011), observed that adding probiotics and rosemary oil to broiler rations had no effect on humoral immune response or blood serum levels of triglycerides and total cholesterol. (. Gazalah & Ali 2008) According to a study, adding 0.5% of rosemary leaves to broiler feeds raised the levels of plasma total protein, albumin, and globulin while lowering those of plasma glucose, total lipid, and cholesterol. Additionally, the study found that rosemary possesses potent (Loetcher et al.,2013) and (Yasar et al., 2011), dried and ground the rosemary and added it to the broiler feed. In a study in which (Polat et al.,2011), Evaluation of serum biochemical parameters in this study revealed that dietary supplementation with rosemary and thyme essential oils significantly decreased serum AST activity in the thyme and rosemary-treated groups, while serum protein, glucose, albumin, uric acid, ALT, and ALP activity did not show significant changes. Although we have no explanation for the decreased AST activity in the thyme and rosemary-treated groups, these results at least suggest that rosemary and thyme essential oils did not have any adverse effects on liver and kidney function. These results support previous reports that showed that feeding broiler chickens with rosemary at levels (of 0.5 and 1 g/kg) did not significantly affect (Total protein, albumin, globulin, creatinine, and AST and ALT) activities [Mona et al., 2010]. This notion also aligns with the findings of several researches who found that administering essential oils of garlic and ginger at doses of 10, 20, and 40 mg/kg did not significantly alter serum AST and ALT activity. [Dieumou, et al., 2009]. Additionally, it has been demonstrated that many herbal plants have hepatoprotective properties and can trigger an endogenous interferon. [Thyagarajan, et al., 2002]. When rosemary oil and rosemary were introduced to broiler feeds, it was shown that the additions had a substantial impact on serum albumin/globulin ratio, total cholesterol, and SOD levels but no statistically significant influence on serum ALT and AST activity. It has been concluded that adding rosemary to broiler feed raised the antioxidant enzymes in the ethanol extract, inhibited lipid peroxidation, decreased blood glucose, and decreased LDL "bad" cholesterol. In groups where 200 mg/kg is administered, it has been found that rosemary in particular has some more favorable impacts on a few biochemical indicators. In contrast to the current findings, Apaydin (Yildirim, et al., 2018) found that broiler diets containing 100 and 200 mg/kg of rosemary decreased AST, raised triglycerides, and had no effect on cholesterol levels.

According to the study's hematological and biochemical parameter data, male quail performance

was not substantially impacted by the addition of thyme or rosemary to their diets. The present results showed that adding rosemary essential oil to male quail diets did not significantly affect red blood cell counts, which were all similar to those used in the control and H/L diets. Packed cell volume significantly increased the growth-promoting effectsUsing thyme and rosemary significantly increased the hemoglobin content of all quails. Numerous studies have examined the hematological impacts of adding certain foods to animal and broiler feeds, and they have generally been found to be beneficial. Some claimed that birds fed diets supplemented with garlic extract had higher RBC counts. [Elnagar, et al., 2003].

When added at a rate of 10 milliliters per liter of water, three days a week, the administration of garlic and ginger also resulted in a notable rise in hemoglobin content. (Rehman, et al., 2011). All treated groups exhibited a considerable increase in total leukocytic count, according to the current study's findings regarding total and differential leukocytic count. These findings are in line with other research that found that feeding laying hens 200 mg/kg of garlic oil significantly raised their WBC count. (Ademola, et al., 2011). Although there is almost no literature available to explain the impact of essential oils of thyme and rosemary on leukocyte differentiation, which can be explained by the oils' stimulatory effects on immunological functions and enhancement of birds' immunocompetence. [Surniyoshi., 1997].

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