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Original Article

Evaluation of Dietary Supplementation of Rosemary in Eastern Libya on Broiler's Performance, Carcass Traits and Some Blood Parameters.

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Abstract

This study was conducted to evaluate the effect of dietary supplementation of rosemary (Rosmarinus officinalis) on the performance, carcass indices and some blood parameters of broilers. Ninety 14-day-old female broiler chicks (Ross 308) were used in this study. The chicks were allotted into 3 groups (30 chicks per group) and each group had 3 replicates (10 chicks per replicate). The control group was fed on a basal diet and the 2nd and 3rd treatments were fed on a basal diet supplemented with 0.4% and 0.5% of rosemary powder (RP) respectively. Diet and water are freely available for the duration of the trial, which lasted for 30 days. Our results indicated that rosemary supplementation significantly improved live body weight, body weight gain, feed intake, and feed conversion ratio. In addition to the improvement in the lipid profile, especially triglycerides and LDL, while it did not affect cholesterol and HDL, the results also showed an increase in globulin levels in the blood, while there was no negative effect on the carcass traits and the weight of the internal organs, as well as on the health status of the liver and kidneys. Collectively, rosemary supplementation is recommended at the level of 0.5% to the diet to improve the performance, physiological status and health status of broiler chicken.

Keywords: Broilers, Rosemary, Performance, Carcass, Blood parameters.

Introduction

Increasing consumer awareness regarding food safety and the danger of unnatural additives in feed such as antibiotics and hormones, as well as not accepting the use of animal proteins in animal feed such as meat meal, fish meal, feather meal and poultry by products meal, pushed major companies and research centers to find natural alternatives that achieve good economic returns and satisfy the consumers. Looking for natural alternatives aims to be a source of vegetable protein which will increase the options in the formation of inexpensive diets, or for use as an alternative feed additive to antibiotics that were banned from use in animal diets in Europe in 2006 due to risks of bacterial resistance of antibiotics and the appearance of

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bacterial mutations that may resist the current antibiotics in use (Castanon, 2007). Aromatic herbs and spices are considered one of the most commonly used food additives in poultry diets due to their content of active phytochemicals. In recent years, they have gained great interest in using them as alternative feed to exert positive effects on health and performance (Ali 2021). Numerous studies have indicated the benefits of using aromatic herbs and spices as antioxidant, antifungal, antibacterial, antiviral, antiparasitic, and anti-cancer, in addition to their affirmative effects as growth promoters and immune stimulants, as well as efficient physiological effects in improving the lipid profile, protein profile and several enzymes in the blood (Cross *et al.*, 2003; Fotea *et al.*, 2015; El-Faham *et al.*, 2015).

Rosemary is one of the herbs of the Mediterranean region that was used in ancient times to treat diseases among the Romans and the Greeks (Al-Sereiti *et al.*, 1999). Rosemary contains several terpenes and phenolic compounds in different proportions (Mathlouthi *et al.*, 2012; Verma *et al.*, 2011). Cineole, Eucalyptol, pinene, camphor, caryophyllene and carvacrol are some of the volatile phenols that are the main constituents of rosemary essential oils, while non-volatile polyphenols form the main compound of the leaves, the most important of which are rosmarinic and carnosic acids. (Liu *et al.*, 2009; Leporini *et al.*, 2020). These phytogenic compounds contained in rosemary show many biological properties such as antimicrobial activity and antioxidant activity (Belenli *et al.*, 2015; Franciosini *et al.*, 2016; Çimrin & Demirel 2016). In addition to other medicinal properties such as treating cancer, diabetes, infections and bacterial diseases, improving liver function, as well as acting as an antioxidant and anticoagulant agent. (Gutiérrez *et al.*, 2010; Wang *et al.*, 2012 .(Therefore, the current study was conducted to evaluate the effect of rosemary feed supplementation on the production and health status of broiler chickens by targeting performance, carcass traits and some hematological parameters such as lipid profile, protein profile and liver enzymes.

Materials and Methods

Animals :

This study was conducted in the Department of Animal Production, Faculty of Agriculture, Omar Al-Mukhtar University - Libya. The study began in October and lasted for 28 days. 90 female broiler chicks (Ross 308) 14 days old were used in the study, the chicks were divided into three treatments (30 chicks\ treatment), each experimental treatment was divided into three replicates and each replicate had 10 chicks. The experiment was conducted in a small animals laboratory with a deep litter system (1× 1.5 m2 for each replicate). for feed and water, we used plastic tube feeders 4 kg, and plastic chicken drinkers 4 Liter .

Plant material and preparation:

The rosemary plants were collected from areas south of Al-Jabal Al-Akhdar - Libya. The plant was identified by Department of Crop Sciences Faculty of Agriculture, Omar Al-Mukhtar

University. We used the leaves and stems of the plant. After collecting the plant, any impurities of other plants were removed, then it was cleaned and air-dried in a shaded place before drying it at a temperature of 55 °C and grinding it with a household electric grinder, then the powder was added to the diet in the quantities that will be mentioned later.

Experimental design :

The first treatment (the control) was fed on a commercial diet as shown in table (1) without any additives, the second treatment was fed on a diet containing 0.4% of the RP and the third treatment was fed on a diet containing 0.5% of the RP. The chicks were raised under the same conditions in terms of temperature, lighting and ventilation.

To determine the performance parameters, the birds were weighed at the beginning of the experiment and then the live body weights were recorded weekly to calculate the weight gain and the final body weight. The feed residues were recorded to calculate the average feed intake (FI) (g) per day and then the feed conversion rate (FCR) was calculated from the ratio of feed consumption (g) to body weight (g) (Irwani *et al.*, 2022). At the end of the trial, after 12 hours of fasting 3 birds from each replicate were weighed and slaughtered to determine the carcass traits and organ weights. The birds were plucked, and the feet, head, and wingtips were removed; they were then eviscerated before determining the carcass's weight. The weights of the breasts, drumsticks, wings, liver and bile, and the whole gastrointestinal tract were recorded. Blood samples were taken at slaughter and collected into vacuum tubes with anticoagulant then centrifuged at 3000 rpm for 10 minutes, at 4 °C and serum was stored at -20 °C until laboratory analyses.

Serum biochemical parameters:

Blood samples were collected on slaughter day from the brachial wing vein (Kelly and Alworth 2013). Tubes containing EDTA were used to prevent coagulation and then placed in a centrifuge (3000 rpm) for 10 minutes at 4°C to collect serum and then stored at -20°C. Serum samples were analyzed for total cholesterol, Triglycerides, low density lipoproteins (LDL), high density lipoproteins (HDL), very low density lipoproteins (VLDL), total protein (TP), albumin (Alb), uric acid, creatinine, glutamic pyruvic transaminase (GPT), glutamic oxaloacetic transaminase (GOT), Bili Direct. DPD, Bili Total DPD, Glucose, Magnesium and Phosphorus. All serum parameters were assayed using a spectrophotometer and commercial test kits of (Randox Laboratories Limited – United Kingdom) and following the manufacturer's instructions. Serum globulin (Glob) was calculated by subtracting the total serum albumin from total serum protein.

Statistical analysis:

Data were subjected to a one-way analysis of variance ANOVA procedure for a completely randomized design CRD, with Duncan's multiple range tests for significance between means using SPSS software package v.20. Differences can be given according to ($P \leq 0.05$) were considered significant. The statistical

model used for this experiment is:

$Yi=\mu+T+Eijk$

Yi = response, μ = general mean, Ti = treatment effect, Eijk = experimental error.

Table (1): Ingredients and chemical composition of the basal diet.

Ingredients (%)	
Corn (8.5%)	54.2
Soybean meal (44%)	37.1
L-Lysine	0.45
Dl-methionine	0.22
Limestone	5.6
Sodium chloride	0.35
Premix[1] (vitamins and minerals)	1
Di Calcium phosphate	1.08
Total	100
Chemical analysis[2]: (%)	
Dry matter	91.7
Crude protein	22.45
Metabolizable energy (kcal/kg)	3325
Crude fat	6.4
Crude fiber	2.28
Ash	10.8

[1]premix (vitamins and minerals). Each 1 kg consists of: vitamin A, 3,600,000 U; vitamin D3, 800,000 U; vitamin E, 7200 U; vitamin K3, 800 mg; thiamine, 720 mg; riboflavin, 2640 mg; calcium pantothenate, 4000 mg; niacin, 12,000 mg; pyridoxine, 1200 mg; folic acid, 400 mg; vitamin B12, 6 mg; biotin, 40 mg; choline, 100,000 mg. #Contents per kilogram: Mn, 39680 mg; Fe, 20000 mg; Zn, 33880 mg; Cu, 4000 mg; I, 400 mg; Se, 80 mg.

[2]Calculated according to NRC (1994).

Results and discussion

Performance traits:

The statistically analyzed results presented in Table (2) showed a significant improvement in the productive performance of broilers fed on rosemary powder. A significant increase (P≤0.05) in the live body weight of birds fed a diet supplemented with 0.4% and 0.5% of rosemary powder was observed at a rate of (2605 g and 2620 g, respectively) compared to the control group (2550 g). Similarly, adding rosemary powder led to a significant increase (P≤0.05) in the total body weight gain of birds compared with birds of the control group, while adding rosemary powder to the feed did not affect the rate of daily body weight gain. The data of the experiment also showed a significant decrease (P≤0.05) in the rate of feed intake in the third group at a rate of 2890 g compared with the first and second groups, which did not record significant differences between them (2915 g and 2930 g, respectively). In addition to

the above, a significant improvement (P≤0.05) was evident in the feed conversion ratio in the second and third groups fed on the rosemary powder compared with the control group, and the third group (0.5% rosemary powder) was significantly (P≤0.05) the better among the experimental groups with an average of 1.38 compared to 1.44 and 1.40 for the first and second groups. The inclusion of aromatic herbs in animal diets has become an alternative to conventional practices due to the consumers' demands for natural and healthy food products. The essential oils of aromatic herbs are a group of active substances that are well-studied as growth promoters. Many studies indicated that adding some plants powder to the diet of broilers improved the growth and feed conversion ratio and reduced mortality (Yarru *et al.*, 2009; Akyildiz and Denli 2016). On the same line, it was found that adding phytobiotics to water or feed improves the performance of laying hens (Osman *et al.*, 2016; Abd El-Hack *et al.*, 2020). Our results are in agreement with Petricevic *et al.*, (2018) who stated that rosemary herb supplementation in the diet clearly improved broiler daily gain, feed conversion and European Production Efficiency Factor value at the end of the experiment, compared with the control group. In the same line, Yesilbag *et al.*, (2011) observed a significant improvement in live weight gain and feed conversion ratio in broilers fed diets supplemented with rosemary volatile oils, but the feed intake was not statistically affected. Similar results were obtained by Abd El-Latif et *al.*, (2013) who reported that the inclusion of rosemary in the broilers' diets increased feed conversion ratio compared with the control group. In addition, Norouzi *et al.*, (2015) indicated that feed intake showed a significant decrease and the feed conversion rate was improved (P≤0.05) in the birds fed on the basal diet supplemented with rosemary, and they mentioned that no effects (P≤0.05) on the average daily gain was observed due to the rosemary supplementation level in comparison with the control group. In support of our findings, Abd El-Hack *et al.*, (2015) observed that feeding Japanese quails on diet containing rosemary (1.5 g/kg diet) improved body weight gain by 3.85% during the whole period of the experiment compared to the control group. In a recent study, Mahgoub *et al.*, (2019) found that birds fed on diets supplemented with rosemary oil showed high feed consumption (P≤0.01) and feed efficiency improvement compared with those fed the control diet. This improvement in productive performance caused by the addition of rosemary in poultry may be because of rosemary essential oils that promote the secretion of amylase, trypsin and renin (Jang *et al.*, 2004) also have anti-pathogenic effects such as C. and E. coli in the gastrointestinal tract (Çimrin & Demirel 2016). On the other hand, other studies have indicated opposite results. Rosemary dietary supplementation had no significant effect on body weight gain (Hernandez *et al.*, 2004; Marzoni *et al.*, 2014; Norouzi *et al.*, 2015; Ghozlan *et al.*, 2017). As well, adding rosemary to broilers' diets had no

The Libyan Journal of AGRICULTURE. Volume (28), No. (1) 2023: 24 -38

significant effects on the feed conversion ratio (Yildirim *et al.*, 2018)..

Table (2): The effect of dietary supplementation of rosemary on the performance parameters of broilers (Values are means ± SE).

Parameter	Dietary treatments		
	Control	0.4% RP	0.5% RP
Initial body weight (gm)	528 ± 12.5	517 ± 11.10	530 ± 11.30
Live body weight (gm)	2550^{c} ± 30.10	2605^{b} ± 30.10	2620^{a} ± 30.10
Total body weight gain (gm)	2022^{b} ± 20.20	2088^{a} ± 20.20	2090^{a} ± 20.15
Daily body weight gain (gm)	72.2 ± 10.20	74.57 ± 10.10	74.64 ± 10.10
Feed intake (gm)	2915^{a} ± 30.30	2930^{a} ± 30.30	2890^{c} ± 30.15
Feed conversion ratio	1.44^{a} ± 0.11	1.40^{b} ± 0.10	1.38^{c} ± 0.10

SE: standard error mean. RP: Rosemary powder

Different letters within the same row are significantly different (P≤0.05).

Meat yield:

Table (3) shows the effect of adding rosemary powder to the broiler diet on carcass features at 42 days of age. From the results, it is clear that adding rosemary powder did not have a significant effect on carcass weight, breast weight and thigh weight compared with the control group birds. In addition, Table (4) shows the effect of the inclusion of 0.4% and 0.5% rosemary powder in broiler diets on internal carcass organs. Statistical analysis of our data showed that dietary rosemary powder had no significant effect on liver weight, heart weight, digestive tract weight, gizzard weight, intestine weight and length, and sternum length compared with the control group (P≤0.05). Nevertheless, the results revealed a significant increase (P≤0.05) in proventriculus weight in the birds of the third group that was supplemented with 0.5% rosemary powder (11.34 g) compared to birds of the control and the second group (8.15 g and 7.36 g respectively). The results of our study agreed with what was approved by Norouzi *et al.*, (2015), which indicated that the use of rosemary powder at a rate of 0.5, 1, and 1.5% in the diet of broiler chickens had no significant effect on carcass weight, breast weight, drumsticks weight and internal organs (liver and bile) weight, while there was a significant increase in the gastrointestinal tract weight at 1.5% of rosemary supplementation. Additionally, a recent study reported that no significant differences in the relative weight of breast muscles, liver, gizzard, heart, edible offal, abdominal fat and carcass yields were noticed in broilers fed on basal diets containing two concentrations (2.5 and 5 g/kg) of the rosemary powder (Sier˙zant *et al.*, 2021).

Table (3): The effect of dietary supplementation of rosemary on the carcass traits of broilers (Values are means ± SE

Parameter	Dietary treatments		
	Control	0.4% RP	0.5% RP
Live body weight (gm)	2532.50 ± 53.40	2631.66 ± 26.04	2610.00 ± 25.16
Carcass weight (gm)	1685.00 ± 20.24	1803.33 ± 15.35	1815.00 ±14.45
Breast weight (gm)	730.00 ± 11.54	786.66 ± 23.15	735.00 ± 69.28
Thighs weight (gm)	442.50 ± 7.21	481.66 ± 9.20	487.50 ± 6.95

SE: standard error mean. RP: Rosemary powder

Table (4): The effect of dietary supplementation of rosemary on the carcass internal organs of broilers (Values are means ± SE)

Parameter	Dietary treatments		
	Control	0.4% RP	0.5% RP
Liver weight (gm)	54.45 ± 7.52	53.12 ± 0.80	64.88 ± 9.49
Heart weight (gm)	15.74 ± 1.48	16.76 ± 2.06	15.79 ± 1.09
Spleen weight (gm)	3.59 ± 0.50	3.36 ± 0.62	2.62 ± 0.09
Digestive tract weight (gm)	299.08 ± 23.35	248.35 ± 19.57	287.31 ± 14.96
Proventriculus weight (gm)	8.15^{b} ± 0.26	7.36^{b} ± 1.04	11.34^{a} ± 1.37
Gizzard weight (gm)	61.55 ± 6.94	49.04 ± 2.73	48.88 ± 0.34
Intestine weight (gm)	126.87 ± 14.54	120.48 ± 18.62	136.23 ± 0.92
Intestine length (cm)	217.33 ± 13.44	221.00 ± 4.61	216.50 ± 10.10
Sternum length (cm)	17.00 ± 0.57	16.83 ± 0.16	16.00 ± 0.57

SE: standard error mean. RP: Rosemary powder

Different letters within the same row are significantly different (P≤0.05).

Blood parameters:

Lipid profile:

Evaluating the effect of food additives on physiological changes in the body is an important factor in measuring the effectiveness of these additives in improving the health of birds. Hematological parameters are one of the most important physiological changes that give a clear picture of the health status of birds and the positivity of these food additives. Many aromatic and medicinal herbs are effective in improving the body's lipid profile. Through our results that appear in Table (5) to assess the lipid profile of broiler chickens fed on diets supplemented with rosemary powder, it is clear that adding rosemary powder had a varying

effect on the lipid profile, as the statistical analysis of the trial data indicates that both cholesterol and HDL blood levels were not significantly affected (P≤0.05). In addition, by adding rosemary powder the blood level of triglycerides and LDL decreased (P≤0.05) in the group of birds fed 0.5 rosemary powder, as well the blood VLDL level decreased (P≤0.05) in the birds of the second and third groups that were fed with a diet supplemented with rosemary powder at a rate of 0.4% and 0.5%. In another word, the inclusion of rosemary in broiler diets showed a positive effect on the blood lipid profile. It is worth noting that many studies indicated that rosemary has various affects on the serum lipid profile. The discrepancies between studies might be attributed to the doses, route of administration as well as experimental conditions. Yildirim *et al.*, (2018) agreed with our finding which indicated that the addition of rosemary powder did not significantly affect the levels of cholesterol and HDL, while it clearly reduced the level of LDL in the blood. Ciftci *et al.*, (2013) found that rosemary oil did not significantly affect LDL, HDL, cholesterol and triglyceride. Alagawany and Abd El-Hack (2015) determined that total cholesterol is not influenced by supplemented rosemary, while LDL levels were decreased and the triglyceride was increased significantly. Abd El-Latif *et al.*, (2013) reported a significant increase in serum concentrations of TG, TC, LDL and HDL.

Table (5): The effect of dietary supplementation of rosemary on the lipid profile of broilers (Values are means ± SE)

Parameter	Dietary treatments		
	Control	0.4% RP	0.5% RP
Cholesterol mg/dl	119.00 ± 3.51	105.73 ± 3.97	109.00 ± 9.00
triglycerides mg/dl	59.00^{a} ± 4.35	48.66^{a} ± 2.72	35.40^{b} ± 4.06
LDL mg/dl	28.36^{a} ± 3.48	26.73^{a} ± 0.89	15.76^{b} ± 1.24
HDL mg/dl	63.33 ± 2.91	63.63 ± 6.09	78.10 ± 6.42
VLDL mg/dl	18.90^{a} ± 3.10	10.33^{b} ± 1.10	7.96^{b} ± 2.26

SE: standard error mean; RP: rosemary powder; LDL: low density lipoprotein; HDL: high density lipoprotein; VLDL: very low density lipoprotein.

Different letters within the same row are significantly different (P≤0.05).

Protein profile:

Measuring protein profile in the plasma is a significant indicator of the immune status of the bird. Plasma proteins contribute to many functions in the blood. Albumin contributes to maintaining blood viscosity and maintaining water balance in the body. Globulin protein contributes to the immune response in the body by improving humoral immunity and the formation of antibodies. Table (6) presents the effect of dietary supplementation of rosemary powder on the protein profile of broilers.

Through the statistical analysis of our data on blood total protein, the results indicated that there was no significant effect of adding rosemary to the diet of broiler chickens among the experimental groups. While adding rosemary caused a significant decrease (P≤0.05) in the blood albumin rate in the second group (0.4% rosemary powder) and third group (0.5% rosemary powder) compared with the control group (1.13 g/dl and 1.23 g/dl vs 1.62 g/dl, respectively). On the contrary, adding rosemary powder to the feed led to a significant improvement (P≤0.05) in the level of blood globulin in the second and third groups at a rate of (1.82 g/dl and 1.83 g/dl respectively) compared with the control group (1.13 g/dl). This is in reasonable agreement with the conclusion of Yildirim *et al.*, (2018), which indicated that the supplemental feeding on rosemary led to a significant decrease in serum globulin. In contrast, there was a significant increase in serum albumin, while there were no significant differences in the serum total protein rate. While a study conducted by Gazalah and Ali (2008) indicated that adding rosemary to the diet of broiler chickens contributed significantly to raising the levels of total protein, albumin and globulin in the blood. On the other hand, Abd El-Latif *et al.*, (2013) reported that there was no effect on the rate of blood total protein, albumin and globulin when feeding broilers on 100 and 200 ml/kg of rosemary oil. In addition, Abd El-Hack (2015) mentioned that adding rosemary at varying rates (3-6-9 g/kg of feed) had no significant effect on the protein profile in the blood.

Table (6): The effect of dietary supplementation of rosemary on the protein profile of broilers (Values are means ± SE)

Parameter	Dietary treatments		
	Control	0.4% RP	0.5% RP
Total protein (g/dl)	**2.75 ± 0.18**	**2.95 ± 0.12**	**2.86 ± 0.37**
Albumin (g/dl)	**1.62^{a} ± 0.07**	**1.13^{b} ± 0.03**	**1.23^{b} ± 0.03**
Globulin (g/dl)	**1.13^{b} ± 0.23**	**1.82^{a} ± 0.11**	**1.63^{a} ± 0.37**

SE: standard error mean. RP: Rosemary powder

Different letters within the same row are significantly different (P≤0.05).

Liver and kidneys status:

The liver and kidney secrete many important enzymes that contribute to accelerating biochemical reactions inside the body, and it should be noted that serious health complications may occur if any of them are inhibited or if its cells are exposed to inflammation or injury. Therefore, when feeding animals on unconventional feed additives, it is necessary to measure some enzymes and excretory substances in the blood that reflect the health status of the liver and kidneys. Table (7) shows the effect of adding rosemary to broiler feed on the liver and kidneys. The statistical analysis of our data revealed a significant decrease (P≤0.05) in the level of serum

The Libyan Journal of AGRICULTURE. Volume (28), No. (1) 2023: 24 -38

creatinine and a significant increase (P≤0.05) in the level of serum ALT enzyme in the birds of the two groups fed on rosemary compared with the control group. it is obvious that the group fed on 0.4% of rosemary powder recorded the lowest level of serum creatinine (0.06 mg/dl), and the group that fed on 0.5% of rosemary powder recorded the highest level of ALT (13.06 U/L) compared with the control group (0.66 mg/dl and 9.56 U/L, respectively). While there were no significant differences among the experimental groups for the rate of uric acid (mg/dl), AST enzyme (U/L), and Bili Total DPD (mg/dl) in the blood. The insignificant alterations in serum biochemical parameters levels such as AST, uric acid and Bili Total DPD indicated the safe use of rosemary as a feed additive in broilers' feed on liver and kidney functions. In addition to the significant decrease in the level of serum creatinine, which is another indication that the use of rosemary as a dietary supplement for poultry does not have any harmful effects on the liver and kidneys. Despite the significant increase in the level of ALT in the blood, which I do not find a scientific explanation for, its level in general remains within the normal levels of birds. Likewise, many herbs showed hepatoprotective activity (Thyagarajan *et al.*, 2002). The results of previous research conducted on rosemary indicated its hepatoprotective activity. Feeding hens on rosemary at rates of 0.5% and 1% did not significantly change liver enzymes (AST and ALT) (Radwan et al., 2008; Mona et al., 2010; Cimrin 2019). In addition, Polat *et al.*, (2011) concluded that added rosemary or its oil to broiler diets exhibited no significant effect on serum ALT and AST activity. Moreover, Abd El-Latif *et a*l., (2013) implied that serum levels of AST, ALT and uric acid did not reveal significant alterations. Also, Ghozlan *et al.*, (2017) reported that serum ALT and creatinine levels did not statistically change by feeding chicken on supplemented rosemary diet. Lately, Yildirim *et al.*, (2018) Administration of rosemary significantly reduced serum ALT, AST.

Table (7): The effect of dietary supplementation of rosemary on some serum biochemical parameters of broilers (Values are means ± SE)

Parameter	Dietary treatments		
	Control	0.4% RP	0.5% RP
ALT (U/L)	9.56^{a} ± 0.23	11.81^{b} ± 0.45	13.06^{b} ± 0.52
AST (U/L)	321.33 ± 16.58	359.66 ± 17.57	330.00 ± 30.00
Creatinine (mg/dl)	0.66^{a} ± 0.03	0.06^{b} ± 0.02	0.08^{b} ± 0.03
Uric Acid (mg/dl)	1.98 ± 0.19	1.43 ± 0.20	1.50 ± 0.17
Bili Total DPD (mg/dl)	0.043 ± 0.01	0.053 ± 0.01	0.070 ± 0.03

AST: aspartate aminotransferase; ALT: alanine aminotransferase; Bili Total DPD: Direct bilirubin conjugated with the diazonium salt 2,4-dichlorophenyldiazonium.

SE: standard error mean. RP: Rosemary powder

Different letters within the same row are significantly different (P≤0.05).

Conclusion

Under the conditions of the present work and based on our results, it can be concluded that rosemary supplementation is recommended at levels of 0.5% which significantly improved the productive performance of broiler chickens, including Live body weight, body weight gain, Feed intake and feed conversion ratio. In addition to the improvement in the lipid profile, especially triglycerides and LDL, as well as an increase in globulin levels in the blood, which gives a good indicator of the improvement of the immune response. Also, there was no negative effect on the carcass traits and the weight of the internal organs, as well as the health status of the liver and kidneys .

Conflict of Interest:

The author declared no conflict of interests.

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تقييم التغذية على أعلاف مكملة بإكليل الجبل في شرق ليبيا على أداء دجاج اللحم وصفات الذبيحة وبعض معايير الدم

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المستخلص

أجريت هذه الدراسة في محطة أبحاث الدواجن بجامعة عمر المختار على عدد 90 كتكوت أنثى دجاج اللحم من سلالة (روس 208) بعمر 14 يوماً. هدفت الدراسة إلى تقييم الأداء الإنتاجي وصفات الذبيحة وبعض معايير الدم لدجاج اللحم الذي تغذى على أعلاف تحتوي على إكليل الجبل (*Rosmarinus officinalis* L.) تم تقسيم الكتاكيت إلى 3 مجموعات (30 كتكوت لكل مجموعة) وكان لكل مجموعة 3 مكررات (10 كتاكيت لكل مكرر). تم تغذية المجموعة الضابطة على عليقة أساسية (بدون إضافة إكليل الجبل) بينما تم تغذية المجموعتين الثانية والثالثة على عليقة أساسية تحتوي على مسحوق إكليل الجبل بنسبة 0.4% و0.5% على التوالي. تم إعطاء العلف والماء بصورة حرة خلال التجربة التي استمرت لمدة 28 يومًا. أشارت النتائج إلى أن إضافة إكليل الجبل في الأعلاف قد حسنت معنوياً ($P\leq0.05$) وزن الجسم الحي وزيادة وزن الجسم واستهلاك العلف ومعامل التحويل الغذائي. بالإضافة إلى التحسن المعنوي ($P\leq0.05$) في مستويات الدهون في الدم، وخاصة الدهون الثلاثية والبروتينات الدهنية منخفض الكثافة (LDL)، بينما لم يؤثر على الكوليسترول والبروتينات الدهنية مرتفعة الكثافة (HDL)، أظهرت النتائج – أيضًا- زيادة معنوية ($P\leq0.05$) في مستويات الجلوبيولين في الدم، بينما لم يكن هناك تأثير سلبي على صفات الذبيحة ووزن الأعضاء الداخلية المدروسة، وكذلك على الحالة الصحية للكبد والكلى. بصورة عامة يوصى بإضافة إكليل الجبل بنسبة 0.5% في أعلاف دجاج اللحم لتحسين الأداء والحالة الفسيولوجية والصحية لدجاج اللحم.

الكلمات الدالة: دجاج اللحم، إكليل الجبل، الأداء الإنتاجي، الذبيحة، معايير الدم.

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