PERFORMANCE OF BROILER CHICKEN FED DIFFERENT LEVELS THYME, ADIANTUM, ROSEMARY AND THEIR COMBINATION

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ABSTRACT

The objective of this study was to investigate the effects of different levels of medical plants (*thymus vulgaris, Adiantum capillus-veneris* L, *Rosemarinus officinalis* and their combination) supplemented in the diet on Physiological and Growth performance traits of broiler chicken. T1 Control (no supplemented), T2 Thyme powder 5 g/kg, T3 Thyme powder 10 g/kg, T4 Adiantum powder 3 g/kg, T5 Adiantum powder 5 g/kg, T6 Rosemary powder 5 g/kg, T7 Rosemary powder 10 g/kg and T8 Mixture (Thyme , Adiantum and Rosemary) with 7.5 g/kg +4 g/kg and 7.5 g/kg, respectively. A Total of 288 unsexed broiler chicks, were randomly distributed to eight treatments with three replicate. Medical plants at different levels added to basal diets at 7th days old. Live body weight and mortality rates were measured weekly. At the end of the experiment the following traits were measured: carcass traits, hematology, blood biochemical, hormonal responses, and serum enzymes parameters. There is a significant effect of medicinal plants on live body weight, feed intake and dressing percentage. Mortality rate in T2 and T7 was significant highest. While, feed conservation was not influenced by medicinal plants. There was a significant effect of treatments on abdominal fat and liver weights. Adiantum powder at different levels has significant effect on bursa and spleen weights compared to other groups. There was a significant effect of treatments on albumin, globulin, cholesterol and glucose concentration. Medicinal plants significantly affect hormonal response. The combination of plants (T8) investigated high concentration of T_3 and T_4 hormones. Also, addition of rosemary observed higher concentration of TSH and GH hormones. There was significant effect of medical plants on AST and ALT enzymes. There is none significant effect of medical plants on meat color among treatment.

Keywords: Medical plants, blood biochemical, hematology, hormone response, enzymes, meat color.
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أستجابة دجاج اللحم على مستويات مختلفة من الزعتر، كزبر البئر و إكليل الجبل وخليطها

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المستخلص

الهدف من الدراسة هي بيان تأثير مستويات مختلفة من النباتات الطبية (الزعتر، كزبرة البئر و إكليل الجبل) إلى عليقة الدواجن على الأداء الإنتاجي والفسلجي لدجاج اللحم. T1 مجموعة السيطرة (بدون إضافات)، T2 زعتر 5 غم/كغم، T3 زعتر 10غم/كغم، T4 كزبرة البئر 5غم/كغم، T5 كزبرة البئر 10غم/كغم، T6 إكليل الجبل 5 غم/كغم، T7 إكليل الجبل 10غم/كغم، T8 خليط (زعتر، كزبرة البئر وإكليل الجبل) 7.5غم/كغم، 7.5غم/كغم و 7.5غم/كغم على التوالي. 288 أفراخ اللحم وزعت عشوائيا على 8 معاملات و 3 مكررات. تم إضافة مستويات مختلفة من النباتات الطبية إلى العليقة عند عمر 7 أيام. تم قياس وزن الجسم الحي والهلاكات أسبوعيا. في نهاية الدراسة تم قياس الصفات التالية: قياسات الذبيحة، صفات الدم، صفات الكيموحيوية للدم، أستجابة الهورمونات وأنزيمات البلازما. من التحليل الإحصائي تبين بوجود فروقات معنوية بين المعاملات في وزن الجسم الحي، كمية العلف المستهلك ونسبة التصافي مقارنة مع مجموعة السيطرة. نسبة الهلاكان كانت أعلى معنويا للمعاملة (2 و7) مقارنة مع مجموعة السيطرة. في حين لم يؤثر معنويا كفاءة التحويل الغذائي بإضافة النباتات الطبية. وجدت فروقات معنوية لدهن الأحشاء، وزن الكبد للمعاملات مقارنة مع مجموعة السيطرة. وقد أثرت نبات كزبرة البئر معنويا على وزن البورسا والصفارة مقارنة مع باقي المعاملات. كما وجدت فروقات معنوية بين المعاملات في صفات ألبومين، كلوبيولين، كوليستيرول و كلوكوز مقارنة مع مجموعة السيطرة. وأثرت النباتات الطبية المستعملة على أستجابة الهورمونات. وجدت تأثير معنوي للخليط T8 على تركيز الهورمونات T3 و T4. كذلك أثرت معاملة الزعتر على هرمون TSH و GH. كما وجدت فروقات معنوية بين معاملات التجربة في تركيز الأنزيمات AST و ALT. ولم نلاحظ تأثير معنوي للنباتات المستعملة على نوعية ولون اللحم.

كلمات مفتاحية: الانتاجية، كفاءة التحويل، النباتات الطبية، صفات الدم، العلف المستهلك.

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INTRODUCTION

Broiler production is one of the most important sources of white meats in any country that because the high costs of red meat as compared with white meat, which has its crucial position in the national economy (7). The highest demand for broiler meat led the producers to intensive livestock production. In intensive farming, diseases spread quickly among birds, this situation obligate formers to apply treatment for all birds in the group as a protective measure against infection (25). Also broiler production is growing quickly as a result of the population expansion and increasing demand for poultry products (44). Generally, using antibiotics drugs which could be administrated in the feed, in drinking water or by injection in poultry for therapeutic and prophylactic purposes and they include a large number of different types of compounds (19). The main objective of antibiotic as growth promoters in poultry industry through improved feed conversion, better appetite, stimulation of the immune system, higher vitality, regulation of the intestinal micro-flora (40 and 12). Broiler breeder producers pressure for checking alternative substance and strategies for poultry growth promotion and prevention of diseases are been investigated, natural additives such as phytogenic and medicinal plants and their products including plant extracts or essential oils have received increased attention because of believed to be safer, healthier and less regarded than synthetic additives (antibiotics) (34, 45, 21, 4 and 5). Medicinal plants and their products are introduced as candidates for use in broiler diets or through drinking water in which their beneficial effects as phytogenic feed additives have been proven (14, 41 and 18). Herbs have been identified to improvement antimicrobial, antiviral, and antioxidative activities and to simulate the immune and endocrine systems (17). Besides, scientists recently observed that the stimulating and appetizing activity of herbs and plant extracts on poultry digestive and immune system could be benefit health and performance of poultry farm (24 and 46). In many studies, the different active components of herbal plants reported the different influence on poultry performance, so the current study aimed to investigate the effects of different levels of herbs (*thymus vulgaris, Adiantum capillus-veneris L* and *Rosemarinus Officinalis*) and their combination in the diet as an alternative of antibiotic growth promoter on Growth Performance, Physiological, meat color, immunological and Carcass traits of broiler chicken.

MATERIALS AND METHODS

The present study was carried out in Poultry Farm of Animal Science, Faculty of Agriculture, University of Bingol, Bingol city/ Turkey. The thyme, adiantum and rosemary were dried under room temperature and grinded to fine powders by Retsch device. The active compounds of the three plants were analyzed by Gas Chromatography/Mass Spectrometry (GC/MS) in central Bingol laboratory, University of Bingol.

Table 1. The volatile compounds in Thyme *(Thyme Kotshyanus*) samples analyzed byGC-MS

No.	Relative time (minute)	Area (% of total)	Identified Compound	Quality
1	15.494	1.96	Pyrimidine	38
2	16.856	9.05	P-Cymene	95
3	17.640	4.03	Gamma-Terpinene	94
4	19.586	5.11	Nonanal	80
5	20.198	0.94	Unknown	27
6	24.369	0.68	Lathosterol	37
7	26.349	60.77	Carvacrol	90
8	28.266	1.23	2-Ethyl-5-Propylphenol	49
9	29.444	3.15	Santolina Triene	45
10	32.483	0.67	Dodecane	59
11	44.459	5.77	2-Amino-5-Nitrothiazole	72
12	46.118	3.91	2-Ethoxy-4,6-Dichloro-Symmtriazine	38
13	46.702	1.24	Silane	14
14	48.785	1.48	Acenaphthenedione	50

Table 2. The volatile compounds in Adiantum (*Adiantum capillus veneris*) samples analyzed by GC-MS

No.	Relative time (minute)	Area (% of total)	Identified Compound	Quality
1	14.762	4.66	Myrcene	91
2	15.884	0.30	Alpha-Phellandrene	93
3	16.255	8.78	Cis-Piperitol, Acetate	56
4	16.851	5.59	2-Isopropyltoluene	86
5	17.526	0.52	Sabinene	94
6	17.978	41.23	Gamma-Terpinene	89
7	18.687	0.47	Terpinolene	95
8	19.105	0.23	3-Carene	90
9	19.620	0.66	Dehydro-P-Cymene	97
10	22.481	0.21	A-Terpinene	90
11	24.498	33.82	Phenol	93
12	29.508	2.44	Caryophyllene	95
13	30.200	0.24	Valencene	94
14	30.446	0.41	Unknown	91
15	54.627	0.46	Ethyltetramethylcyclopentadiene	89

Table 3. The volatile compounds in Rosemary (*Rosmarinus Officinalis*) samples analyzed by GC-MS

No.	Relative time (minute)	Area (% of total)	identified Compound	Quality
1	17.989	51.87	Alpha-Pinene	96
2	21.674	31.63	Eucalyptol	96
3	22.367	0.60	Gamma-Terpinene	95
4	23.294	0.33	Terpinolene	95
5	24.112	0.64	Nonanal	90
6	24.678	0.09	Filifolone	90
7	27.019	5.88	Camphor	94
8	27.368	2.86	Isoborneol	94
9	27.980	1.09	Alpha-Terpineol	86
10	28.970	0.14	Unknown	52
11	29.519	0.58	Verbenone	99
12	29.742	0.37	Trans-2-Tridecen-1-Ol	90
13	30.189	0.33	Bornyl Acetate	91
14	31.161	0.21	Sphingosine	94
15	31.716	0.06	Carvacrol	90
16	32.237	0.68	Unknown	90
17	32.746	0.08	Copaene	96
18	32.998	0.37	Trans-2-Octenal	94
19	33.988	0.10	Hexane	35
20	34.778	1.91	Beta-Caryophyllene	99
21	36.145	0.19	Humulene (Alpha)	98

Experimental design

An investigation was performed on Ross-line 308. A Total of 288 day old mixed sex broiler chicks were purchased from BANVİT Company in Elazig city, Turkey. On arrival, the chicks were raised in cages for 7 days. At 7^{th} day old, the birds were randomly distributed to eight treatments group with three replicate of twelve chicks based on completely randomized design (Table 4). Birds were housed in a proper atmosphere and hygienic conditions. The birds were fed with standard broiler starter (1 to 21 days) and finisher (22 to 42 days) rations throughout the experimental period. The ration was formulated to meet nutrient requirements of chicks (33). The birds had free fed non-pelleted diets and water throughout the period of the experiment. The thyme, adiantum and rosemary powders were added to diets at 7^{th} day old to different

experimental diets (Table 4). The Lighting program was provided for broiler flock according to the Ross manual guide 2009.

Table 4. Levels of medical plants added to experimental diets

Experimental groups	Additives	Amount (g)/kg
T1	Control (no additive)	-
T2	Thyme powder	5 g/kg
T3	Thyme powder	10 g/kg
T4	Adiantum powder	3 g/kg
T5	Adiantum powder	5 g/kg
T6	Rosemary powder	5 g/kg
T7	Rosemary powder	10 g/kg
T8	Mixture (Thyme , Adiantum and Rosemary)	7.5 g/kg +4 g/kg and 7.5 g/kg, respectively.

Table 5. Percent of diets ingredient for experimental broiler starter and finisher diets and their calculated chemical analysis

Ingredient	Starter diet	Finisher diet
Corn	50	52
Wheat	5	4
Barley	3	4
Wheat bran	5	5
Soybean meal	32	28
vegetable oil	2	3
Limistone	1.5	2.05
Dicalcium phosphate	0.8	0.8
DL methionine	0.2	0.2
L- lysine	0.2	0.2
Anti-fungul	0.05	0.05
Salt	0.2	0.2
vit. Primex	0.5	0.5
Approximately Analysis	Chemical Composition	
Crude protein	21.76	18.88
Energy Kcal/kg	2978.10	3027.60
Fat	4.40	5.46
Linoleic acid	2.18	2.71
Crude fiber	3.17	3.15
Methionine	0.58	0.56
Lysine	1.40	1.28
Tryptophan	0.35	0.32
Meth. + Cystine	0.74	0.68
Threonine	0.88	0.81
Arginine	1.44	1.30
Ca	0.93	1.14
P	0.44	0.43
Na	0.15	0.15
Cl	0.18	0.18

Live body weight, Body weight gain, Feed intake, Feed conversion ratio, Mortality rate was measured weekly. At the end of the experiment (49 days), the birds were fasting for 12 hours a sample of two random birds (male and female) from each replicate with in a treatment was slaughtered to determine the dressing percentage and blood sample collection for hematological parameters such as RBCs, PCV and Hb and biochemical, enzyme and hormone parameters.

RESULTS AND DISCUSSION

Table 6 indicate the influence of different levels of thyme, rosemary, adiantum and their combination on live body weight of broiler chicken. There is a significant effect of medicinal plants on live body weight. In 1st week, there was a significant effect in live body weight in T4 group which contain 3 g/kg of adiantum. In 6th week of ages, in the exception of T3 group, medical plants significantly improved live body weight compared to control group. The results are in

agreement with many researchers of thyme (22, 9 and 39), rosemary (32, 16, 20 and 42) who mentioned that adding thyme and rosemary powder or essential oil into the broiler diet or drinking water had a significantly improvement the live body weight of chicks compared to control group. On the other hand, the results of the present study are not consistent with those of (6, 11, 13, 43). The supplemented plants to diet, it is of substantial importance to expect prospect of suboptimal performance (30). Consequently, this may lead to an improvement of endogenous increased production of digestive enzyme secretion (amylase, lipase, trypsin, chemo trypsin, trypsin and protease) and the improved utilization of digestive products through enhanced liver function which enhance the digestion and absorption process of carbohydrates, lipids and proteins (29 and 47). Moreover, cell walls of rosemary leaves contain high crude fiber particularly, cellulose which may have hampered nutrient utilization by chickens and the appetizing effect of active ingredient (15, 23 and 42).

Table 6. The influence of different levels of thyme, adiantum, rosemary and their combination on broiler´s live body weight (Mean± Standard error)

Treatment	1st week	2nd week	3rd week	4th week	5th week	6th week
T1	126.82±3.47^{bc}	360.39±16.51^{ab}	613.50±24.64^{abc}	1039.23±34.35^{ab}	1682.02±39.39^{a}	2108.44±50.47^{d}
T2	130.50±3.47^{a}^{bc}	378.45±16.51^{a}	660.26±24.64^{a}	1069.68±34.35^{a}	1707.72±39.39^{a}	2233.04±50.47^{c}
T3	122.25±3.47^{c}	334.62±16.51^{ab}	534.07±24.64^{c}	936.46±34.35^{b}	1468.39±39.39^{b}	2198.35±50.47^{c}^{d}
T4	135.63±3.5^{a}	340.35±16.61^{ab}	605.55±24.80^{ab}	1063.70±34.57^{a}	1669.49±39.65^{a}	2374.49±50.80^{a}
T5	128.30±3.47^{a}^{bc}	348.01±16.51^{ab}	542.01±24.64^{bc}	1017.64±34.35^{ab}	1606.82±39.39^{a}	2278.85±50.47^{a}^{bc}
T6	128.89±3.5^{ab}^{c}	362.86±16.61^{a}	568.49±24.80^{abc}	993.67±34.57^{a}^{b}	1573.02±39.65^{a}	2352.29±50.80^{a}^{b}
T7	134.99±3.47^{a}^{b}	372.46±16.51^{a}	614.49±24.64^{ab}	1054.28±34.35^{a}	1640.32±39.39^{a}	2428.02±50.47^{a}
T8	119.87±3.5^{c}	299.55±16.61^{b}	578.87±24.80^{abc}	1018.65±34.57^{ab}	1605.84±39.65^{a}	2209.33±50.80^{b}^{c}
Gender	S	S	S	S	S	S
Male	138.24±1.61^{a}	398.63±7.67^{a}	656.43±4.45^{a}	1115.53±15.96^{a}	1749.02±18.31^{a}	2477.45±23.46^{a}
Female	118.57±1.91^{b}	300.55±9.09^{b}	522.89±13.57^{b}	932.80±18.92^{b}	1489.38±21.70^{b}	2068.25±27.81^{b}

*a, b, c, d, **Means with different superscripts in the same column differ significantly (P<0.05).T1= control, T2=Thyme 5 g/kg, T3=Thyme 10 g/kg, T4= Adiantum 3 g/kg, T5=Adiantum 5 g/kg, T6= Rosemary 5 g/kg, T7=Rosemary 10 g/kg, T8=Thyme 7.5 g/kg+ Adiantum g/kg+ Rosemary 7.5 g/kg. S= Significant**

Table 7 indicated that the effects of different levels of thyme, rosemary, adiantum and their combination on total feed intake, feed conversion and mortality of broiler chicken. There is a significant effect of medicinal plants on feed intake and mortality rate while, feed conversion ratio did not affected among treatment. The results are in agreement with many published research papers (16 and 41) who reported that added thyme and rosemary to broiler diet or drinking water had not effect on total feed intake compared to control group. On the other hand, the results of the study are in contrast to that finding of (3, 30, 32, 38). The result of feed conversion ratio was in agreement with founding (8, 13, 41, 43), that mention thyme and rosemary added to diets or drinking water didn't had any effects on feed conversion ratio compared to control group. In contrast, the results are in disagreement with the findings of (2,16, 32,48) which noted that using rosemary and thyme powders in the broiler`s diets had a significant effect on feed conversion ratio of broiler chicks. These results of mortality rate were agreed with the previous results obtained by (22, 30, 37) that observed thyme and rosemary added to broiler chicken diet or drinking water had no difference on mortality rate compared to control group. On the other hand, the results are in disagreement with the findings of (2, 8 and 27) that mentions different levels of thyme and rosemary in broiler diets or drinking water had significantly effect on mortality compared

to control group. Broiler chicken fed T3 had significant higher dressing percentage compared to control group and other treatments, While, the result of (30) that reported when added 25 g/kg of rosemary powder to male broiler diet had no effect on dressing percentage compared to control group. In contract, the result was disagreed of those (8, 11, 34) that observed added thyme powder in broiler diet had no effect on dressing percentage compared to control group.

Table 7. The influence of different levels of thyme, adiantum, rosemary and their combination on broiler´s total feed intake, feed conversion ratio and mortality rate (Mean± Standard error)

Treatment	Total Feed Intake (g)	Feed Conversion Ratio	Mortality Rate %	Dressing (%)
T1	4135.9±158.81^{ab}	1.73±0.06^{a}	10.33±0.41^{b}	67.34±1.1^{b}
T2	3785.0±158.81^{b}	1.71±0.06^{a}	12.00±0.41^{a}	67.29±1.1^{b}
T3	4003.7±158.81^{ab}	1.72±0.06^{a}	11.67±0.41^{ab}	73.51±1.1^{a}
T4	4320.7±158.81^{ab}	1.70±0.06^{a}	11.33±0.41^{ab}	69.85±1.1^{b}
T5	4029.7±158.81^{ab}	1.73±0.06^{a}	11.67±0.41^{ab}	66.75±1.1^{b}
T6	4461.6±158.81^{a}	1.79±0.06^{a}	11.33±0.41^{ab}	68.97±1.1^{b}
T7	4175.8±158.81^{ab}	1.74±0.06^{a}	12.00±0.41^{a}	68.42±1.1^{b}
T8	3972.0±158.81^{ab}	1.72±0.06^{a}	11.67±0.41^{ab}	68.93±1.1^{b}

***a, b, Means with different superscripts in the same column differ significantly (P<0.05).T1= control, T2=Thyme 5 g/kg, T3=Thyme 10 g/kg, T4= Adiantum 3 g/kg, T5=Adiantum 5 g/kg, T6= Rosemary 5 g/kg, T7=Rosemary 10 g/kg, T8=Thyme 7.5 g/kg+ Adiantum 4 g/kg+ Rosemary 7.5 g/kg.**

Table 8 shows the influence of different levels of thyme, rosemary, adiantum and their combination on lymphoid organs weights of broiler chickens. The influences of different levels of medical plants on relative weight of bursa Fabricius and spleen of broiler had no significantly differences compared to control group. Otherwise, there are significant differences between treated groups. These searchers (31, 26, 43) achieved the same results as we did and they did not find any effect of thyme and/ or rosemary on the relative weight of bursa and spleen in the broiler chicks compared to control group. Otherwise, the results are not consistent with those of (35 , 38**).**

Table 8 The influence of different levels of thyme, rosemary, adiantum and their combination on lymphoid organs weights of broiler chickens (Mean± Standard error)

Treatment	Bursa of fabricius (g)	Spleen (g)
T1	1.62±0.13^{ab}	2.20±0.17^{abc}
T2	1.47±0.13^{ab}	2.04±0.17^{bc}
T3	1.43±0.13^{ab}	1.82±0.17^{c}
T4	1.47±0.13^{ab}	2.62±0.17^{a}
T5	1.77±0.13^{a}	2.03±0.17^{bc}
T6	1.46±0.13^{ab}	2.03±0.17^{bc}
T7	1.28±0.13^{b}	1.93±0.17^{bc}
T8	1.45±0.13^{ab}	2.47±0.17^{ab}
Gender	N.S	N.S
Male	1.44±0.07	2.20±0.09
Female	1.55±0.07	2.09±0.09

***$^{a, b, c}$ Means with different superscripts in the same row differ significantly (P<0.05).T1= control, T2=Thyme 5 g/kg, T3=Thyme 10 g/kg, T4= Adiantum 3 g/kg, T5=Adiantum 5 g/kg, T6= Rosemary 5 g/kg, T7=Rosemary 10 g/kg, T8=Thyme 7.5 g/kg+ Adiantum g/kg+ Rosemary 7.5 g/kg**

Table 9 show the effect of medical plant on broiler serum biochemical. Treatments have no significant effect on the total protein, albumin, globulin and A/G ratio compared to control

group, while there were significant differences among treated groups (albumin and globulin). Moreover, cholesterol level and serum glucose was significant affected by treated groups compared to control group in either directions (negative and positive). The results of total protein are in agreement with the findings (35, 1,3, 6, 20, 43) compared to control in broiler chicken. Like the most medical herbs such as adiantum or thyme or rosemary supplementation, this improvement may be due to the biological function of these herbs which enhance the immune response. Serum biochemical parameters indices directly express the status of nutrition, health and metabolism of the animals. Therefore, this induce can be used to assess the effect of herbs on growth conditions, food metabolism, immunity and mechanisms of broilers (48).

Table 9 The influence of different levels of thyme, adiantum, rosemary and their combination on broiler´s blood serum biochemical (Mean± Standard error)

Treatment	Total Protein g/dL	Albumin g/dL	Globulin g/dL	A/G ratio	Cholesterol mg/dL	Glucose mg/dL
T1	2.77±0.04^{a}	1.61±0.04^{ab}	1.22±0.04^{a}	1.35± 0.08^{a}	167.41±2.59^{c}	175.16±1.31^{c}
T2	2.74±0.04^{a}	1.65±0.04^{ab}	1.17±0.04^{ab}	1.38±0.08^{a}	153.60±2.59^{d}	175.01±1.31^{c}
T3	2.78±0.04^{a}	1.62±0.04^{ab}	1.13±0.04^{ab}	1.45±0.08^{a}	186.52±2.59^{a}	176.93±1.31^{c}
T4	2.75±0.04^{a}	1.69±0.04^{a}	1.08±0.04^{b}	1.52±0.08^{a}	177.73±2.59^{b}	180.98±1.31^{b}
T5	2.75±0.05^{a}	1.53±0.04^{b}	1.22±0.04^{a}	1.29±0.08^{a}	146.71±2.85^{d}	175.23±1.4^{c}
T6	2.65±0.05^{a}	1.55±0.04^{b}	1.13±0.04^{ab}	1.35±0.08^{a}	149.94±2.85^{d}	175.13±1.44^{c}
T7	2.65±0.05^{a}	1.58±0.04^{ab}	1.08±0.04^{b}	1.47±0.08^{a}	138.63±2.85^{e}	186.90±1.44^{a}
T8	2.68±0.05^{a}	1.56±0.04^{b}	1.14±0.04^{ab}	1.36±0.08^{a}	182.49±2.59^{ab}	181.27±1.31^{b}
Gender	N.S	N.S	N.S	N.S	N.S	N.S
Male	2.7±0.02	1.61±0.02	1.14±0.02	1.41±0.04	162.52±1.4	178.51±0.71
Female	2.7±0.02	1.59±0.02	1.59±0.02	1.38±0.04	163.24±1.3	163.24±0.66

***a, b, c, d, e Means with different superscripts in the same column differ significantly (P<0.05).T1= control, T2=Thyme 5 g/kg, T3=Thyme 10 g/kg, T4= Adiantum 3 g/kg, T5=Adiantum 5 g/kg, T6= Rosemary 5 g/kg, T7=Rosemary 10 g/kg, T8=Thyme 7.5 g/kg+ Adiantum g/kg+ Rosemary 7.5 g/kg. A/G ratio= albumin to globulin ratio**

Table 10 show the effect of medical plants on broiler's serum hormone. Various types and levels of medical plants have significant effects on T3, T4, TSH and GH hormones. Generally there are no significant differences between treatments and control groups

Table 10 The influence of different levels of thyme, rosemary, adiantum and their combination on broiler´s serum hormones (mean± standard error)

Treatment	T3 ng/ml	T4 ng/ml	TSH ng/ml	GH µIU/ml
T1	1.86±0.10^{ab}	0.83±0.08^{ab}	0.57±0.02^{b}	3.89±0.09^{ab}
T2	1.52±0.10^{bcd}	0.84±0.08^{ab}	0.58±0.02^{b}	3.68±0.09^{b}
T3	1.67±0.10^{abc}	1.01±0.08^{a}	0.59±0.02^{b}	3.82±0.09^{ab}
T4	1.44±0.10^{cd}	1.04±0.08^{a}	0.58±0.02^{b}	4.01±0.09^{a}
T5	1.26±0.10^{d}	0.73±0.09^{b}	0.56±0.03^{b}	3.90±0.10^{ab}
T6	1.55±0.10^{bcd}	0.98±0.09^{ab}	0.66±0.03^{a}	4.09±0.10^{a}
T7	1.71±0.10^{ab}	0.98±0.09^{ab}	0.55±0.03^{b}	4.02±0.10^{a}
T8	1.93±0.10^{a}	1.1±0.08^{a}	0.57±0.02^{b}	4.05±0.09^{a}
Gender	N.S	N.S	N.S	N.S
Male	1.60±0.06	0.97±0.04	0.58±0.01	3.94±0.05
Female	1.64±0.05	0.91±0.04	0.59±0.01	3.92±0.05

***a, b, c, d Means with different superscripts in the same Column differ significantly (P<0.05).T1= control, T2=Thyme 5 g/kg, T3=Thyme 10 g/kg, T4= Adiantum 3 g/kg, T5=Adiantum 5 g/kg, T6= Rosemary 5 g/kg, T7=Rosemary 10 g/kg, T8=Thyme 7.5 g/kg+ 4 g/kg, Adiantum g/kg+ Rosemary 7.5 g/kg. GH= growth hormone, TSH= thyroid stimulation hormone, T4= tetraiodothyronine or thyroxine, T3= Triiodothyronine. N.S= not significant**

Table 11 show the effect of different levels of thyme, rosemary, adiantum and their combination on broiler enzymes. Supplementation of medicinal plant to broiler chicken diets affected significantly on each of Creatinine, AST and ALT enzymes. Broiler

chicken fed diet medicinal plant had higher Creatinine level compared to control and other treated groups. AST in group T7 significantly lower than control and other treatments groups. The result was in agreement with (35, 38 and 48). Moreover, the result of our study was disagreed with (23 and 36).

Table 11 The influence of different levels of thyme, adiantum, rosemary and their combination on broiler´s serum enzyme (Mean± Standard error)

Treatment	Creatinine (mg/dL)	AST (U/L)	ALT (U/L)
T1	1.27±0.04[b]	0.18±0.01[a]	0.30±0.01[a]
T2	1.33±0.04[b]	0.16±0.01[a]	0.27±0.01[ab]
T3	1.78±0.04[a]	0.17±0.01[a]	0.26±0.01[ab]
T4	1.27±0.04[a]	0.15±0.01[a]	0.26±0.01[ab]
T5	1.39±0.05[b]	0.16±0.01[a]	0.29±0.01[a]
T6	1.30±0.05[b]	0.15±0.01[a]	0.27±0.01[ab]
T7	1.34±0.05[b]	0.09±0.01[b]	0.27±0.01[ab]
T8	1.25±0.04[b]	0.15±0.01[a]	0.24±0.01[b]
Gender	N.S	N.S	N.S
Male	1.34±0.02	0.15±0.01	0.27±0.01
Female	1.39±0.03	0.15±0.01	0.27±0.01

[*a, b, c] **Means with different superscripts in the same Column differ significantly (P<0.05).T1= control, T2=Thyme 5 g/kg, T3=Thyme 10 g/kg, T4= Adiantum 3 g/kg, T5=Adiantum 5 g/kg, T6= Rosemary 5 g/kg, T7=Rosemary 10 g/kg, T8=Thyme 7.5 g/kg+ Adiantum g/kg+ Rosemary 7.5 g/kg. AST= Aspartate amino transferase, ALT= Alanine Amino Transferase**

Table 12 indicat that the effect of different levels of thyme, adiantum, rosemary and their combination on broiler´s meat color. The different levels of medical plant have no significant effect on lightness, redness and yellowness of meat color in broiler compared to control group. The result was in agreement with finding of (28 and 10) who's reported that using dietary quercetin and methoxylated quercetin extracted from onion or dietary onion in broiler diet had no significantly effected in broiler´s meat color.

Table 12 The influence of different levels of thyme, rosemary, adiantum and their combination on meat color of broiler chickens (Mean± Standard error)

Treatment	L*	a*	b*
T1	53.15±1.79[a]	1.77±0.32[a]	6.83±0.72[a]
T2	54.29±1.79[a]	1.22±0.32[a]	6.60±0.72[a]
T3	51.25±1.79[a]	1.48±0.32[a]	6.41±0.72[a]
T4	53.35±1.79[a]	1.73±0.32[a]	7.13±0.72[a]
T5	50.97±1.79[a]	1.20±0.32[a]	6.35±0.72[a]
T6	53.73±1.79[a]	1.08±0.32[a]	8.13±0.72[a]
T7	53.49±1.79[a]	1.23±0.32[a]	7.12±0.72[a]
T8	51.72±1.79[a]	0.78±0.32[a]	6.20±0.72[a]
Gender	S	N.S	N.S
Male	54.20±0.9[a]	1.2±0.16	6.75±0.36
Female	51.29±0.9[b]	1.42±0.16	6.95±0.36

[*a, b] **Means with different superscripts in the same row differ significantly (P<0.05).T1= control, T2=Thyme 5 g/kg, T3=Thyme 10 g/kg, T4= Adiantum 3 g/kg, T5=Adiantum 5 g/kg, T6= Rosemary 5 g/kg, T7=Rosemary 10 g/kg, T8=Thyme 7.5 g/kg+ Adiantum g/kg+ Rosemary 7.5 g/kg. . L*= lightness, a*= redness; b* = yellowness**

Supplement thyme, Adiantum, Rosemarinus and their mixture to broiler chickens with diet improved productive and physiological traits.

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