THE INFLUENCE OF DIETARY SALVIA AND LAVENDER POWDERS ON PRODUCTIVE PERFORMANCE, SOME PHYSIOLOGICAL PARAMETERS, AND IMMUNITY OF BROILER UNDER STOCKING DENSITY STRESS

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ABSTRACT

The purpose of this experiment was to increase poultry meat production by increasing the number of chickens reared in the same area and managing it by using medicinal herbs *Salvia officinalis L* and *Lavandula angustifolia L*. in the broiler chicken diet. 705 one-day-old chicks were randomly distributed into to7 treatments with three replicates for an area of two m^2 floor system in each replicate for each treatment, during 35 days of the study. T0 negative control 75 chicks, 25 chicks for each replicate 12-13 chicks per m^2 fed standard diet. T1 positive control (stocking density without supplementation)105 chicks, 35 each replicate chicks 17-18 per m2 fed standard diet. The same stocking density for T2, T3, T4, T5, and T6 have been given standard feed with supplemented herbals, salvia 0.7%, 0.9%, lavender0.7%, 0.9%, and mixed 0.7% respectively. Depending on the results, chickens reared in stress stocking density with supplementations led to higher improvement of body weight, meat production, body weight gain (BWG), feed conversion ratio(FCR g feed/g weight), production index PI, carcass weight (g) and dressing percentage, RBCs 10^6cells/mm^3, lymphocyte%, of increasing activity of thyroid hormones T3, T4 (nmol/L) boost antibody titers of ND and IBV when compared with positive control. However, heterophil%, stress indicator H/L ratio, glucose mg/ dL and cholesterol mg/ dL significantly reduced. The results showed that adding sage and lavender plants to broiler feed is effective in improving productivity, immunity, and resistance characteristics in reducing the adverse effects of stress caused by increasing the intensity of broiler rearing in the same area.

Keywords: stocking density, stress indicator, salvia, lavender, meat production, FCR, immunity.
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تأثير التغذية بمساحيق النباتات الميرمية و اللافندر(الخزامي) على الأداء الإنتاجي وبعض الصفات الفسيولوجية والمناعية تحت إجهاد زيادة كثافة السطحية للدجاج اللحم في فترة الصيف

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المستخلص

الهدف من هذه الدراسة هو زيادة إنتاج لحوم الدواجن عن طريق تقليل المساحة وإدارتها باستخدام مسحوق الأعشاب الطبية الميرمية *Salvia officinalis L* والخزامي *Lavandula angustifolia L*. تم توزيع 705 فرخة بعمر يوم واحد بشكل عشوائي على 7 معاملات بثلاث مكررات على مساحة 2 م^2 خلال 35 يومًا من الدراسة. السيطرة السلبي 75طير، 25 طير لكل مكرر 12–13 طير لكل متر مربع (م)2 تمت اعطاء عليقة قياسية. T1السيطرة إيجابي (زيادة كثافة الطيور بدون اضافات مسحوق النباتات الطبية) 105 طير، 35 طير لكل مكرر17–18 لكل م 2 اعطت الطيور العليقة القياسية. تم إعطاء نفس كثافة الطيور لكل من T2، T3، T4، T5وT6عليقة قياسية مع مسحوق الأعشاب ،المرمية0.7٪، 0.9٪، لافندر 0.7٪، 0.9٪، مخلوط (ميرمية +لافندر) 0.7٪ على التوالي. اعتمادًا على النتائج، الأفراخ التي أضيفت مسحوق النباتات ميرمية والخزامي مع عليقة القياسية تحت الإجهاد كثافة الطيور ادت إلى تحسين أعلى في وزن الجسم (غم)، وإنتاج اللحوم (غم)، وزيادة وزن الجسم (غم) ، كفاءة التحويل الغذائيFCR جم علف/ وزن جرام)، مؤشر الإنتاج PI، وزن الذبيحة (غم) ونسبة التصافي ، كريات الدم الحمراء خلايا10^6 / ملم ^{3} ، الخلايا الليمفاوية٪، عند مقارنتها بالمعاملة السيطرة الإيجابية. ومع ذلك ، انخفضت خلايا المسؤولة عن الاجهاد خلايا المتغايرة (الهيتروفيل) % ، ونسبة مؤشر الاجهاد H/L، والجلوكوز ملغم / ديسيلتر والكوليسترول ملغم / ديسيلتر. اضافة الي زيادة نشاط هرمونات الغدة الدرقية T4،T3 (nmol / L) تعزز الأجسام المضادة لـ ND و IBV بشكل الملحوظ .النتائج اظهرت أن نبات الميرمية والخزامى فعالان في المقاومة إجهاد في التقليل من آثار الضارة لإجهاد زيادة كثافة الطيور في دجاج اللحم.

الكلمات المفتاحية: كثافة الطيور، مؤشر الإجهاد، الميرمية، الخزامي، إنتاج اللحوم، معدل التحويل الغذائي، المناعة.

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INTRODUCTION

Stocking density plays an important role, especially during summer Poultry producers all around the world attempt to maximize the production of meat and egg as much as possible per square meter of the area while minimizing production losses due to overcrowding, to produce an economic return (33). Stocking density is really important mostly in summer, due to higher mortality, lower quality of meat, immunosuppression occur in broilers at greater stocking densities and hot conditions (37). Furthermore, (17) stated that a reliable indicator of avian stress is the heterophil to lymphocyte ratio H/L increase in heterophils and decrease in lymphocytes are shown by broilers subjected to stress. H/L ratio elevation with growing stocking density has been reported that high stocking density is stressful in broiler growth. The physiological reflex of the body to stress is also expressed in increased plasma cholesterol and glucose levels (31, 15). As well as, Poultry farmers modify feed to counteract the negative effects of high ambient temperatures. Some chicken farmers utilize medical herbs supplements to help them relief heat stress in their homes. Medicinal herbs are one of the solutions that are beneficial to relieving the effects of heat stress (35). However, due to the in-feed use of anticoccidials has been restricted worldwide. Medicinal plants, natural herbs, and their essential oils all have potential coccidiostat activity and suppressing ability of infections in the intestinal mucosa birds, forcing researchers to re-examine alternate types of coccidial management (14). Sage *Salvia officinalis L*) and Lavender (*Lavandula angustifolia L*) are the strong two medical plants) well-knowns as powerful aromatic and the two medicinal herbs belong to *the Lamiaceae* (*Labiate*) mint family are one of such alternatives that could be used as a feed additive (9, 29). They contain a variety of active ingredients with bactericidal, immunomodulatory, antiviral, anticancer, and anti-oxidative properties that are used in broiler and laying hen feed. Inhibitory effects on pathogens, and involvement in various body systems, such as the endocrine and immune systems. It has been discovered that lavender enhances appetite and digestion, but it can also affect other physiological functions that contribute to the maintenance of good health and welfare and quality of animal products it was shown that linalool had appetizing properties and stimulated the digestion processes in animals (17,19,33, 36). Sage and lavender are two medicinal plants that are commonly used to calm the body and reduce depressive symptoms, the role of lavender aromatherapy in anxiety and stress reduction was investigated by (38). They could affect animal health and productivity, as well as the quality of animal products. Moreover, sage has the role of decreasing heterophil, H/L ratio, plasma cholesterol, and increasing lymphocyte. As well as immunity titers against Newcastle disease and avian influenza viruses (12). About concerning the previous studies and due to a lack of research in this area, it is also possible to increase meat production by kg per meter square in the area during summer conditions, resulting in higher economic returns, this study aimed to look into the effects of *Salvia officinalis L* and *Lavandula angustifolia L* on reducing the stress of stocking density during summer without having any negative consequences. Productive performance and some physiological parameter of broiler have been studied.

MATERIALS AND METHODS

Experiment location: The present study was carried out in July- August period in the summer of 2020, in (Gardarash) a poultry research field which is followed Animal Resource Department -College of Agriculture Sciences and Engineering, Salahaddin University, Erbil–Kurdistan region- Iraq.

Experiment design: The experiment was performed on (day-old of 705 Ross chicks) were distributed randomly into 7 treatments each treatment is divided into 3 replicates and reared during 35 days. The number of chicks depends on the meter square in the floor system (litter) according to the stocking density(S.D), a total of 21 boxes(with 2 meters)is distributed as the following: T0 negative control 75 chicks 25 in each replicate12-13 in each m^2. Birds reared per m^2 standard level no stocking density, T1 positive control T2, T3, T4, T5, and T6 with stocking density105 birds in each treatment, 35 in each replicates 17-18 birds per m2. All birds were

fed commercial broiler mashed feed with feed additives salvia and lavender powder. The birds in two control treatments were fed with no supplementations. The additives begun in T2 with 0.7%of salvia powder and 0.9% salvia, 0.7% lavender, 0.9% lavender, 0.7% mixed powder (0.35% salvia+0.35% lavender) were added into standard broiler feed in T3, T4, T5, and T6, respectively, In each box(replicate), there was a feeder and a drinker feed and drinking water were given ad libitum.

House management: In the house, 21 litter boxes had one feeder and one drinker in each. The House was controlled in temperature and humidity by a thermostat, and all treatments have had the same conditions. In the first week, the temperature was between 34- 32°C and the second week was 31- 30°C and third until the research finished the range was between 29-28°C with 65- 55% humidity. The light program was 24 hours lightness in the first week, 22 hours lightness with 2 hours darkness in the second week. During the third week until finishing the experiment was 19 hours of lightness with 5 hours darkness especially during hot hours from 12 pm till 5 pm that's due to decreasing the bird's body activity. The litter was wet, mainly in the crowded treatments and because the birds were drinking water and spill it on the litter, the litter was exchanged twice from the third week for decreasing ammonia level in the house.

Studied traits and data collection and analysis: During 35 days of the experiment data of productive performance has been collected live body weight LBW(g), Bodyweight gain BWG (g), Feed intake FI(g/bird), Feed conversion ratio FCR(g feed/ g weight), Relative growth, Mortality%, and Production Index (PI)has been recorded weekly. On the last day of the experiment, one male and one female have been slaughtered in each replicate to take data of Carcass and Dressing Percentage. For hematological test male and females blood in each replicate has been taken and collected in the tube with anticoagulant Heparin, however for serum separation has been collected in the tube without anticoagulants for biochemical test Glucose (mg/dL), Cholesterol (mg/dL) by Cobas Integrata400 plus, as well as thyroxine T4 (nmol/L)and Triiodothyronine T3 (nmol/L)by Cobas e411. In addition for immunity test against Newcastle Disease ND antibody titer and Infectious Bronchitis Virus IBV antibody titer has been determined by ELISA.

Table 1. Herbal chemical components

Elements (mg)	Salvia	Lavender
Fe	46	50
Zn	81	41
Cu	22.4	15
K	30	20
Na	60	13

The tests were determined chemically by sky ray instruments and Flame photometer, the tests were done in the college central laboratory.

Table 2. Compound and chemical composition of ration

Ingredients%	Starter1-14d	Grower15-28d	Finisher29-35d
Corn	57.00	63.50	64.00
Soybean meal 46	39.50	33.00	32.50
Oil	1.525	1.50	1.60
Limestone	1.31	1.20	1.33
Vitamins-Minerals mix*	0.025	0.025	0.025
Salt	0.05	0.05	0.05
Calculated nutrient content (%):			
Protein	22	20.62	18.62
Energy K.cal/g	2901.17	2995.85	3142.622
Fat	2.1745	2.226	2.3735
Fiber	16.435	16.435	3.2
Methionine	0.7415	0.7082	0.7336
Lysine	1.17036	1.0824	0.9316
Phosphorous	0.2573	0.2497	0.2568
Calcium	0.4347	0.4253	0.9795
Sodium	0.1423	0.1428	0.2487

Vitamins were provided in 1 kg in diet as the followings 1: Vitamin A=24.000. IU, Vitamin D3 (Cholecalciferol)=6.000IU,VitaminE (Alphatochopherol acetate) = 60. mg, VitaminK3 (Menadoin) =6 mg, VitaminB1= 4 mg, Vitamin B2= 10 mg, Vitamin. B6 = 10 mg, Vitamin B12 =30 mg, Biotin= 0.1 mg, Pantothenic acid = 20 mg, Nicotinic acid=80 mg, Folic acid = 1.6 mg, Antioxidant (BHT)= 5 mg.In addition, the following trace elements were included in 1kg diet: Fe(from Iron Sulphate)= 100mg, Cu(from Copper Sulphate= 20 mg, Mn(from Manganese Oxidase)= 160 mg, Zn(from Zinc oxidase)= 120mg,I(from Calcium iodate)= 2 mg, Se(from Sodium Selenite)= 0.5mg. All feed chemical analysis were done in the laboratory of Evan feed company depending on (24).

Statistical analysis

Statistical Analysis System (30) was used to analyze the data of the study to determine the effect of different coefficients on the characteristics of the randomized design (CRD). For performance traits(LBW, BWG, FI, FCR, PI, Mortality Carcass weight, Dressing percentage) used CRD, as the following linear model.

Yij = μ + Ai + eij

For blood traits and immunity test used Completely Randomized Design, factorial experiment (30). (10) multiple range tests were used to determine the significant differences ($p<0.05$) and ($p<0.01$) among treatments.

Yijk = μ + Ai + Bj + AB(ij) + eijk

RESULTS AND DISCUSSION

The poultry industry's business goal of producing the most grams of chicken per square meter of area. Even though there is very little information about these two plants, especially when they are mixed. The impact of powdered salvia and lavender on broiler performance under S.D. are presented in table (3). According to the results, there was an improvement in all supplemented treatments, LBW (g), BWG (g) significantly ($P\leq0.01$) increased particularly, salvia and lavender 0.7%, 0.9% and mixed with 0.7% similarly to negative control while compared to positive control. However, no differences have been indicated in FI among the treatments, the supplementations led to an improvement of FCR and significantly ($P\leq0.05$) better than the positive control. These results are significantly similar with normal S.D. treatments (Negative control), while significant difference with stocked treatments – no supplementations (positive control). Based on the current findings, a high-density rate such as 2343g/one bird equal to 41007.0 g/m^2 for the finisher phase 35 days appears to be recommended by adding salvia, followed by lavender 0.9%= 40132.0 g and mixed 0.7%= 40570.0g meat production as it achieves. However, negative control =29375.0 g meat production as well as positive control=36633.0 g meat production. Season effect significantly of recording ideal stocking density in broiler production, which is 16 birds/m^2 of floor area for the winter period and 10 birds/m^2 for the summer period, according to (21) observed that inadequate feeders did not affect FI among treatments. It is obvious that all treatments consumed about the same amount of feed, on the same line FCR was reduced in supplementation treatments. Physical access to feeders was probably constrained due to increasing stocking density as well as conflict between birds to get to the feeder in one of these cases. Previous studies examined several food supplements to see whether they could optimize the quantity and quality of final products without affecting the birds' feed efficiency (25, 36). Most studies on the effect of feeding medicinal plants appear to show that the improvement in FCR is a consequence in FI without changes in BWG. During the last week of birds' life, there was a substantial effect of bird density on the production index particularly, during the high density (34). Salvia and lavender are belonged to the *Lamiaceae* plant family and contain phenols and flavonoids as important components. The improvement in feed utilization and growth performance due to the addition of salvia, lavender, and a combination of the two may be due to an improvement in the metabolic system caused by an increase in enzymatic activity. Sage and lavender components have a variety of effects, including antimicrobial, antioxidants, anticoccidial, anti-inflammation, antiseptic activity, anti-cancer, followed by anti-stress increased production of digestive enzymes, and implantation of digestive products by enhancing ring liver function (17). The improvement of performance due to the addition of salvia, lavender, and a combination of the two may be due to the presence of bioactive compounds polyphenols and flavonoids included in the plants perform as a digestibility enhancer, balancing the gut microbial ecosystem and stimulating the secretion of endogenous digestive enzymes, enhancing poultry growth performance (4). On the other hand, herbals contain the strongest antioxidants which are rosmarinic acid, Linalool, linalyl acetate potential of active ingredients in the plants' cause of decreasing and preventing free radicals that happened during lipid oxidations during metabolic process and followed meat production (5). Furthermore due to the desired odor of herbals, Linalool, for example, has been shown to

increasing appetizing and palatability properties and to stimulate digestion processes in animals (7). According to the current investigation, lavender essence enhanced up to 0.7 % has a negative effect. This result is in the line with (20)who demonstrated that some active metabolites of medicinal plants have a strong odor or taste, which might reduce feed intake and so limit their use in animal nutrition. Previous research has revealed that herbals containing saponins when taken in high amounts and cause a reduction of feed intake due to better taste(38).

Table 3. Broiler management under stress stocking density and adding salvia and lavender in the diet its effect on production performance

BWG	FI	FCR	LBW		
	g feed/g weight		week/ bird	g Treatments	g
Negative control	2350.00±28.87^{a}	2303.08±28.76^{a}	3599.06±24.53	1.56±0.02^{bc}	
Positive control	2093.33±29.63^{c}	2047.62±29.70^{c}	3451.27±18.51	1.69±0.03^{a}	
Salvia 0.7%	2210.00±66.58^{b}	2163.47±66.48^{b}	3446.60±96.86	1.59±0.01^{bc}	
Salvia 0.9%	2343.33±29.63^{a}	2297.31±29.94^{ab}	3590.35±39.09	1.56±0.03^{bc}	Lavender
0.7%	2293.33±63.60 ^{ab}	2246.74±63.76^{ab}	3548.08±4.52	1.58±0.04^{bc}	Lavender 0.9%
2160.00±10.00^{c}	2114.22±10.07^{bc}	3452.98±42.48	1.63±0.02^{b}	Mix 0.7%	
2318.33±28.92^{ab}	2272.49±28.62^{ab}	3496.65±25.10	1.54±0.01^{c}		
	0.108	0.026	P- value	0.003	0.000

LBW= live body weight by gram. BWG= body weight gain by gram. FI= feed intake g week/ bird. FCR= feed conversion ratio g feed/g weight. $^{a\ --\ c}$ Means within columns with different superscripts differ significantly at (P<0.01) and (P<0.05). ±Standard error . *P* = probability.

The findings in the present study demonstrated that the PI significantly highest in supplemented treatments, especially in mixed 0.7% compared with the positive control shown in table (4). As well as, the carcass weight (g)was significantly(P≤0.01) higher in salvia 0.9% and lavender 0.7% and all treatments were better than the positive control. Dressing % among all treatments salvia 0.9% effect higher significant (P≤0.01), while the lower value observed in lavender 0.9%. the results obtained in agreement with(29) who observed when fed a high level of lavender in the diet significantly (P<0.05) reduced the weight of abdominal fat followed by decreasing in carcass weight compared to the control treatment. Furthermore, the results of this study are similar to previous research on chickens, which found that feeding diets enriched with Salvia powder improved the relative weights of the carcass, giblets, total edible meat, and Fabricia gland of broilers (11). Similarly, researchers recorded that stocking density did not influence mortality (23).

Table. 4 The influence of adding salvia and lavender in broiler diet under stress stocking density on production efficiency and carcass.

Treatments	PI	Mortality%	Carcass weight g	Dressing%
Negative control	362.93±8.20^{ab}	1.0±0.0	1701.83±83.08^{ab}	73.89±1.39^{ab}
Positive control	274.41±3.70^{c}	1.2±0.2	1523.67±50.99 ^{d}	73.96±0.76^{ab}
Salvia 0.7%	307.49±17.02^{bc}	0.9±0.0	1612.50±26.67 ^{c}	73.04±0.83^{b} Salvia
0.9%	372.94±3.82^{ab}	0.9±0.5	1755.50±37.06 ^{a}	75.75±0.33^{a}
356.78±38.12^{ab}	1.2±0.2	1718.83±17.93^{a}	75.00±17.20^{ab}	Lavender 0.7%
Lavender 0.9%	314.93±15.78^{b}	1.0±0.0	1567.50±17.79^{cd}	73.60±15.43^{b}
1670.00±25.76^{b}	74.76±0.39^{ab}	420.31±9.71^{a}	0.5±0.0	Mix 0.7%
P- value	0.032	0.222	0.003	0.007

PI= production index. $^{a\ --\ d}$ Means within columns with different superscripts differ significantly at P<0.01), (P<0.05) and non-significant. ±Standard error. *P* = probability

The hematological and biochemical results are presented in Table 5, it's obvious that the supplementations treatments under S.D. cause of significant (P≤0.05) raise the number of RBC10^{6} cells/mm^{3}, Lymphocyte%, however, Heterophil 9% dropped in treatments that received the supplementations under S.D. that similar with negative control compared with positive control. Moreover, the indicator H/L ratio significantly (P≤0.01) decreased in all

treatments compared with positive control. Cholesterol mg/dL decreased significantly (P≤0.05)by lavender 0.9% and the combination between salvia and lavender 0.7%, as well as, the Glucose mg/dL decreased in all treatments and significantly(P≤0.01)compared with positive control. Similar to the findings, increasing the stocking density from 28000 to 40000 g/m^2 resulted in changing blood profile and reduce RBCs due to hemodilution which follows increasing body radiation temperature and panting and increase of drinking water (2, 8). The results of this study corroborated the outcomes of the previous study by (26) who used medicinal plants when observed that overcrowding stress causes haemoconcentration because birds receive less oxygen, leading to hypoxia, which stimulates erythropoietin secretion and leads to erythropoiesis in stressed birds. The findings of a recent study found that, the H/L ratio increased with increasing the number of birds per area increased (16,18). Furthermore, (28) reported that overcrowding caused leukocytopenia and heterophil cells raised with lymphocyte dropping numbers Heterophil/Lymphocyte (H/L) ratio which called stress indicator. Thus herbals as coolants are used as per the season of their availability to optimize their utilization and help the blood cells maintain their normal levels and reduce stress. Furthermore, sage powder reduces heterophil, H/L ratio, and glucose, while, boosting lymphocytes (38, 17). Another indicator of stress is the biochemical profile of birds. The mean blood glucose has been significantly (P≤0.01) higher in positive treatments than the negative control treatment, the findings are similar to (26) when recorded that overcrowding increase serum glucose level. The current results are in agreement with those (13) when demonstrated that adding 1% of *Lamiaceae* family in drinking water decreased level of serum glucose. Moreover, the results are in agreement with (12) when observed that adding 0.2% sage to the broiler feed reduced cholesterol from 153.75 to 127.50 mg/dL. In addition, Chicks fed supplemented with 12 g salvia powder/kg feed had the lowest plasma triglyceride, cholesterol, HDL, and LDL values (11). Based on the findings of this study, lavender essence might well be effectively utilized as an antibacterial agent in broiler diets without compromising growth performance decreased glucose level, while effected non-significant on cholesterol (23). The hypocholesterolemic qualities attributed to the defatted section of the dried leaves, which is rich in fibrous substances and may inhibit intestinal cholesterol absorption, could explain the lower plasma total cholesterol levels (18, 10). The results disagree with those of (1) who found that adding sage plant leaves the power to the broiler diets at levels of 1 and 2 % had a significant influence on plasma parameters.

Table 5. The impact of adding salvia and lavender in broiler diet under stress stocking density blood and serum biochemical traits

Treatments	RBCs 10^6 cells/mm^3	Lymphocyte %	Heterophil %	H/L Ratio	Cholesterol mg/dL	Glucose mg/dL
Negative control	2.77±0.21^{a}	67.48±0.65^{b}	24.73±0.3^{c}	0.37±0.01^{b}	118.50±2.6^{ab}	197.00±5.13^{bc}
2.59±0.20^{b}	65.80±0.63^{c}	27.98±0.14^{a}	0.43±0.0^{a}	130.83±4.6^{a}	253.67±3.75^{a}	Positive control
Salvia 0.7%	2.73±0.20^{ab}	67.98±0.63^{b}	24.88±0.15^{c}	0.37±0.0 ^{b}	127.17±6.3^{a}	185.67±23.53^{c}
Salvia 0.9%	2.78±0.24^{a}	70.45±0.82^{a}	23.08±0.44^{d}	0.33±0.0 ^{d}	121.17±8.0^{ab}	198.50±11.24^{bc}
Lavender 0.7%	2.89±0.22^{a}	71.12±0.82^{a}	21.88±0.45^{e}	0.31±0.01^{e}	120.67±2.0^{ab}	205.50±5.72^{bc}
Lavender 0.9%	2.73±0.21^{ab}	67.32±0.63^{b}	26.30±0.28^{b}	0.39±0.01^{ab}	111.67±4.7^{b}	221.00 ± 5.82^{b}
Mix 0.7%	2.79±0.20^{a}	67.86±0.56^{b}	24.22±0.14^{c}	0.36±0.0^{c}	124.17±2.9^{b}	201.33±7.56^{bc}
P- value	0.021	0.039	0.004	0.009	0.047	0.013

RBCs= Red Blood cells MSE= mean of standard error. $^{a\ --\ e}$ Means within columns with different superscripts differ significantly at P<0.01), (P<0.05) and non-significant. ±Standard error. *P* = probability

The influence of supplementations under S.D. on thyroid hormone T3, T4 (nmol/L) and against diseases ND, IBV are observed in table 6, the rate of T3 and T4 increased significantly (P≤0.01) in all treatments except positive control, as well as the titer of antibodies against ND and IBV have had the same result. The findings of this study agree with those of (18, 31) who found that lavender elevated immune levels. Additionally, salvia could be

utilized as a supplement to the broiler to boost performance as well as health status (3). This is probably by their immune-stimulating properties, such herbal plants have beneficial effects on livestock growth and health. Lavender Calcium influx inhibition reduces glutamate and norepinephrine releasing. Glutamate and norepinephrine have roles in anxiety pathogenesis and act as an antidepressant (20,22,32). Nevertheless, This may act as an anti-stressor to affect thyroid action as a result of stimulating the secretion of T2 and T3 from the thyroid gland to broiler blood. Lymphocytes aid in the normalization of their functions, leading to improved health resulting in increased T-lymphocyte cell and natural killer cell activity (6). Similar to the findings, medical plants have been shown to stimulate the development of immunological organs such as the thymus and spleen, as well as boost antibody production against ND and IBV. Moreover, the ability to raise the level of immunity could be a return to containing a good amount of Zn, Fe, and Cu on both herbals. Additionally, Polysaccharides derived from medicinal plants dramatically enhanced antibody titer in vaccinated chicken. according to (27). As well as, birds were given 1.2% sage powder, they had the highest ($P \leq 0.05$) antibodies titer against Newcastle, infectious bronchitis, and influenza, while the control treatment had the lowest immune response (12).

Table. 6 The effect of dietary salvia and lavender on broilers under stocking density on thyroid hormones and resistance to diseases

V	ND	IBTreatments	T3 nmol/L	T4 nmol/L
Negative control	2.81±0.17^{bc}	8.71±0.60^{a}	3941.50±1659.05^{ab}	5359.50±546.15^{ab}
Positive control	2.29±0.08^{c}	5.63±0.15^{b}	1014.83±133.06^{b}	2110.50±454.74^{b}
Salvia 0.7%	3.18±0.18^{ab}	8.97±0.42^{a}	5458.50±1501.89^{ab}	5761.83±1383.44^{ab}
alvia 0.9%	3.55±0.15^{a}	9.81±0.84^{a}	3884.50±721.54^{ab}	6434.54±2586.31^{a}S
Lavender 0.7%	3.60±0.37^{a}	10.27±0.62^{a}	5782.67±2684.53^{ab}	6865.83±723.48^{a}
Lavender 0.9%	3.10±0.18^{ab}	8.45±0.65^{a}	5449.67±953.62^{ab}	5590.33±2637.71^{ab}
Mix 0.7%	3.23±0.20^{ab}	9.29±0.62^{a}	7870.67±1518.40^{a}	4030.33±1254.46^{ab}
P- value	0.0096	0.000	0.041	0.012

$T_{3=}$ Triiodothyronine. T_4= Thyroxine. ND= Newcastle disease. IBV= Infectious Bronchitis Virus. $^{a\ --\ c}$ Means within columns with different superscripts differ significantly at (P<0.01) and (P<0.05). ±Standard error. *P* = probability

Conclusion

According to the conclusions of the study, food supplementation with 0.9 % salvia and 0.7% lavender powders and mix of salvia and lavender 0.7% under stocking density throughout the summer can improve broiler performance and boost meat mass output without creating any obvious side effects. Furthermore, the recommended supplementation resulted in a drop in the stress indicator H/L ratio, glucose, and an increase in the stress indicator H/L ratio, hyperglycemia, and improved disease resistance in the birds. Finally, under stress, salvia and lavender improved the examined properties of the birds in comparison to a non-supplemented treatment under the same stocking density.

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