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The Impact of Varying the Amounts of Thyme, Rosemary, and Garlic and Their Combination on Local Chickens' Carcass Characteristics and Productive Performance

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تأثير تنويع كميات الزعتر وإكليل الجبل والثوم ومزيجها على خصائص ذبيحة الدجاج المحلي والأداء الإنتاجي

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Abstract:
This work was carried out at the Faculty of Veterinary Medicine and Agriculture, University of Zawia, during the period from March to May 2024, for 6 weeks. The study examined the effect of a mixture of aromatic medicinal plants (thyme, Rosemary, and garlic) at different levels on the productive performance and body weight of local chicks of domestic chickens.
The results show that feeding on 100 mg of thyme per kg of feed had a significant increase ($P \geq 0.05$) in feed intake during the first and second periods of the study (W1-W3), (W3-W6) was 7679.40 compared to the control group, which gave the lowest value of 7678.00.
The average body weight improved significantly for the treatment fed on 100 mg of thyme and rosemary where it recorded a percentage of 252.76 and 282.16, respectively.
The weight of the treatment was fed on a mixture of garlic, thyme, and rosemary, where the highest significant difference was recorded at 330 grams.
The thyme treatment 100 mg/kg recorded a percentage of 14.10 in the liver and spleen, a percentage of 2.30. The treatment containing a mixture of garlic, thyme, and rosemary affected the heart level, as this treatment recorded the highest significant difference it recorded a percentage of 2.60 grams.
The intestinal weights of the various groups did not differ significantly.
There was a significant effect on the percentage of cecal weight in groups fed 100 mg thyme, 100 mg rosemary, and 100 mg garlic.

Keywords: Thyme, Rosemary, Garlic, Feed additives, Internal organs of chicken .

الملخص
تم تنفيذ هذا العمل في كلية الطب البيطري والزراعة، جامعة الزاوية، خلال الفترة من مارس إلى مايو 2024، لمدة 6 أسابيع.
تم دراسة تأثير مزيج من النباتات الطبية العطرية (الزعتر، إكليل الجبل، والثوم) على مستويات الأداء الإنتاجي و وزن الجسم من الدجاج المحلي.
أظهرت النتائج أن التغذية على 100 ملغ من الزعتر لكل كيلوغرام من الأعلاف ادي لزيادة كبيرة ($P \geq 0.05$) في تناول التغذية خلال الفترات الأولى والثانية من الدراسة (W1-W3) ، (W3-W6)حيث كان 7679.40 مقارنة مع المجموعة الضابطة ، والتي أعطت أدنى قيمة 7678.00.
تحسن متوسط وزن الجسم بشكل كبير للمعاملة التي يتغذى فيها الطائر على 100 ملغ من الزعتر وإكليل الجبل حيث سجل نسبة مئوية قدرها 252.76 و 282.16 ، على التوالي.

وزن المعاملة التي تم تغذيتها على مزيج الثوم والزعتر واكليل الجبل كان قد سجل اعلى فرق معنوي عند 330 جرام.
سجلت المعاملة المغذاة على الزعتر 100 ملغ/كغ نسبة مئوية 14.10 في الكبد والطحال، وهي نسبة 2.30. تأثرت المعاملة المغذاة على المزيج الذي يحتوي على الثوم والزعتر وإكليل الجبل على مستوى القلب، حيث سجلت هذه المعاملة أعلى فرق كبير، حيث سجلت نسبة مئوية قدرها 2.60 جرام.
ولم تختلف أوزان الأمعاء بين المجموعات المختلفة بشكل كبير. كان هناك تأثير كبير على النسبة المئوية لوزن الاعور في المجموعات التي تغذت 100 ملغ من الزعتر، و 100 ملغ من إكليل الجبل، و 100 ملغ الثوم.

الكلمات المفتاحية: الزعتر، إكليل الجبل، الثوم، إضافات الأعلاف، الأعضاء الداخلية للدجاج.

I. Introduction

Consuming animal protein is crucial to ensuring that humans get all the protein they need. Cattle, sheep, goats, rabbits, fish, and poultry are examples of livestock that might supply this [1].

Poultry farming is one of the primary methods used to solve the problem of low animal protein consumption. The farmers turned to intensive livestock production in response to the largest demand for broiler meat. Because diseases spread quickly among birds in intensive farming, farmers are required to treat every bird in the group as a preventative precaution against infection [2].

Additionally, the population growth and rising demand for poultry products are driving a rapid increase in broiler output [3].

Antibiotics unquestionably play a crucial function in animal husbandry as a growth and health-promoting agent[4].

Even if the performance of the birds grown with these feed additives was good, their possible adverse effects became a global public health concern [5].

For generations, people have utilized plants, particularly herbs, for culinary and medical purposes. Certain plants have been crucial in preserving human health and enhancing human well-being for millennia [6].

The European Union has outlawed growth promoters as feed additives following the use of most antibiotics because of their cross-resistance to infections and tissue residues. Researchers have looked for antibiotic substitutes. According to this perspective, aromatic plants are becoming increasingly significant because of their antibacterial properties and ability to stimulate animal digestive systems [6].

When the benefits of using medicinal plants and their derivatives as phytogenic feed additives have been demonstrated, they are introduced as potential additions to broiler diets or through drinking water [7].

Thyme is well-known as a potent growth promoter and a suitable substitute for chemical ingredients in the global chicken business [8]. These substances have positive benefits on the health and productivity of chickens [9]. Because of this herb's antifungal [10], and anticoccidial qualities [11], it has drawn increased attention.

Garlic has been demonstrated to have antibacterial properties as well as to improve feed palatability and feed intake[12].

Strong antioxidant [13], antibacterial, antiviral, anti-inflammatory, and anticarcinogenic properties have long been associated with rosemary and its components [14].

When broiler diets including rosemary were fed, there was a considerable improvement in the (FCR) feed conversion ratio [15,16], immunological function, and carcass characteristics [17].

Animals' immune systems, metabolism, digestion, and antibacterial properties can all be enhanced by herbs [18]. Because they are safer, healthier, and less valued than synthetic additions (antibiotics), natural additives like medicinal plants and their derivatives, such as plant extracts, have drawn more attention [19].

As an alternative to antibiotic growth boosters, the current study sought to determine how different dosages of herbs (thyme, garlic, and rosemary) and their combination in the diet affected the growth performance, physiological, meat color, immunological, and carcass characteristics of broiler chickens. Several studies have reported different influences on poultry performance caused by the active components of herbal plants.

Materials and Methods

This study was carried out during the period from March to May 2024, for 6 weeks. The study examined the effect of a mixture of aromatic medicinal plants (thyme, Rosemary, and garlic) at different levels on the productive performance and body weight of local chicks of domestic chickens.

This study was conducted over the course of six weeks, from March to May 2024. The study investigated the effects of varying concentrations of aromatic medicinal herbs (garlic, rosemary, and thyme) on the body weight and productivity of local domestic chicken chicks.

The current study was also planned and implemented to determine the possibility of improving the bird’s internal organs, feed conversion coefficient, and feed consumption.

The University of Zawia Local Ethics Committee for Animal Experiments gave its approval for the current experimental activity, which was conducted in the Faculty of Veterinary Medicine and Agriculture's Research Laboratory (Al-Ajeelat).

The investigation was conducted on 75 one-day-old domestic chicks, that were brought from the same city (Zawia City), which were weighed and distributed randomly in a completely random design into five experimental treatments Each treatment contained 15 birds, which were distributed into 3 replicates, with 5 birds in each replicate.
Cage breeding was used to raise the chicks. The trial lasted from one week to six weeks of age, and the temperature in the breeding house was maintained within the typical range.
A seven-day adaptation time was permitted prior to the commencement of the study. Animals were given unlimited access to food and water.

Plant material
The plant powders used in the experiment were collected from the local Libyan market.

Experimental protocol
75 domestic chicks in all were divided into five experimental groups of 15 birds each at random, and they were acclimated to comparable housing and management circumstances for seven days.
Three replicates were used in the experiment, and the birds were assigned using a fully randomized approach.
Chickens were divided into the following treatments: treatment 1. Received standard basal diet. Without any additives and was used as a control group. The second treatment contained 100 mg of thyme, the third treatment contained 100 mg of Rosemary, the fourth treatment contained 100 mg of garlic, and the fifth treatment contained a mixture of thyme, Rosemary, and garlic, 100 mg/kg, respectively.

The most important measurements taken during the experiment period:
1- Body weight.
Each bird's live body weight was measured at the start and finish of the experiment, and the formula was then used to determine the change in live body weight.
Average Daily Gain=Final Weight-Initial Weight/Research Time
2-Feed consumption:
The weight of feed consumed (g) for each replicate was calculated for each period by subtracting the amount of feed remaining from that supplied.
Feed Intake=Feed Given-Remaining Feed
Feed Digestibility=Feed Intake-Fecal/Feed Intake*100%
Feed Efficiency=Average Daily Gain/Feed Intake*100%
3-Feed conversion ratio:
The feed conversion ratio (the amount of feed (g) needed to produce one gram of body fat) was calculated by dividing the amount of feed consumed by the number of birds in each treatment.
Feed Conversion Ratio=Feed Intake/Average Daily Gain
4- The weight of the bird's internal organs:
After the end of the trial period, random samples from each treatment were slaughtered, the weight of the entire internal organs of the body was taken, and the percentage of dressing and meat/ bone ratio for all treatments was calculated in the formula.
Organ or Body part weight percent 100/Live weight* Organ or Body part weight [20].
Statistical Analysis
Statistical analysis was done by one-way analysis of variance (ANOVA) followed using the SPSS software package, version 26.00. P values < 0.05 were considered as significant. The results are expressed as mean ± standard deviation (SD) for each group.

Result and Discussion
Table (1) shows the effect of thyme, rosemary, garlic, and their combination on the average body weight during the experimental period. The results indicated that thyme, garlic, and a mixture of aromatic medicinal plant elements affected the average body weight of the bird during the different study periods compared to the control group.
The group with the lowest value in average weight was the control group. In contrast, the group that ate 100 mg thyme, 100 mg garlic, and the mixture of 300 mg in the diet showed significant differences compared to the group that was fed a diet containing 100 mg of rosemary, the control group, and the other experimental groups.
Thyme has a vitally productive performance when added as a complementary food to the diet of broilers. It stimulates the immune system, causes quantitative changes in white blood cells, enhances digestion, is used as a growth stimulant, and increases body gains, feed intake, and feed efficiency during the first week of the experiment. It gave less significant results during the rest of the trial period, possibly due to its warming effect on the intestines.
Recently, there has been interest in aromatic plants and the essential oils or extracts they produce as possible growth promoters [21].
Allium sativum, or garlic, has long been used as a spice and home remedy [22].

Garlic's sulfur-containing chemicals (Alliin, Diallylsulfides, and Allicin) are bioactive components that may be in charge of some of the plant's unique characteristics [23].
This is what was observed in the results, as garlic, thyme, and coriander gave different significant and non-significant results during the study period. This indicates that aromatic medicinal plants have an effective role in the growth of the body and support the health condition of the animal [24].
Herbal extracts or active components in animal nutrition may have positive impacts on immune response activation, endogenous digestive enzyme production, and hunger and feed intake [25,26].

Table 1: Cumulative weekly feed consumption (g/b) of chickens fed on thyme, rosemary, garlic, and their combination (Mean± Standard error).

Treatment groups	Age (weeks)					
	W1	W2	W3	W4	W5	W6
T1	1540.00 ±25.66	3061.00 ±30.12	3077.00 ±32.21	3150.00 ±36.32	3176.00 ±43.82	3150.00 ±37.02
T2	1533.40 ±22.72^{a}	3080.00 ±61.68	3066.00 ±30.22	3207.00 ±42.83^{b}	3189.00 ±46.60	3189.00 ±46.62^{ab}
T3	1370.00 ±33.27^{ab}	3047.00 ±24.87^{b}	3080.00 ±61.68	3117.00 ±15.95	3130.00 ±35.22	3135.00 ±35.82
T4	1540.00 ±29.29^{a}	3078.10 ±26.47^{b}	3099.00 ±62.32	3203.00 ±41.05^{a}	3141.00 ±36.18^{b}	3141.00 ±36.18^{b}
T5	1540.00 ±29.29^{a}	3080.00 ±61.68^{a}	3055.00 ±29.96^{b}	3157.00 ±36.89	3158.00 ±37.44	3200.00 ±48.19^{abc}
CD	S	S	S	S	S	S
CV %	3.553	2.042	4.405	3.183	2.174	1.609

*a, b, c, Means with different superscripts in the same column differ significantly (P<0.05).T1= control, T2=Thyme 100 g/kg, T3= Rosemary 100 g/kg, T4=Garlic 100 g/kg, T5= Mixture of Thyme 30 g/kg + Rosemary 30 g/kg + Garlic 30 g/kg. S= Significant.

Table (2) indicates the average weekly feed consumption of chickens fed on thyme, rosemary, garlic, and their mixture. Eating 100 mg of thyme per kg of feed showed a significant increase ($P \geq 0.05$) in feed intake compared to the control group during the first and second periods of the study (W1-W3), (W3-W6) was 7679.40 compared to the control group, which gave the lowest value of 7678.00, and this is in agreement with what the scientist mentioned. [27] found that adding 100 mg and 0.50% of thyme to stratified diets improved the feed conversion ratio (FCR), and egg production, and it reduced the E. coli in the fecal content. The group fed with 100 mg of rosemary outperformed the rest of the groups during the third period of the study (W1-W6) compared to the control group. As rosemary is a well-known biological plant and is considered one of the biologically active ingredients that can improve production results or animal health, the results of adding rosemary increased feed consumption and feed conversion [28,29].
It was stated that rosemary plant additives improve the microbiological condition of the intestine, reduce the number of pathogens, and increase the total number of beneficial bacteria, which leads to enhanced immunity, increased resistance to diseases of the digestive system, and increased productive performance [30].

Table 2: Weekly average feed consumption of chickens that fed on thyme, rosemary, garlic, and their combination (Mean± Standard error).

Treatment groups	Age (weeks)		
	W1-W3	W3-W6	W1-W6
T1	7678.00 ±160.66	9476.00 ±190.12	17154.00 ±295.21
T2	7679.40 ±160.72^{a}	9476.00 ±190.68^{a}	17374.00 ±298.22^{ab}
T3	7497.00 ±159.27^{b}	7775.00 ±150.87^{b}	15272.00 ±284.68^{a}
T4	7717.00 ±163.29^{ab}	8560.10 ±162.47^{ab}	16277.00 ±290.32^{b}
T5	10832.00 ±260.29^{abc}	8955.00 ±169.68^{abc}	19787.00 ±350.96^{abc}
CD	S	S	S

*a, b, c, Means with different superscripts in the same column differ significantly (P<0.05).T1= control, T2=Thyme 100 g/kg, T3= Rosemary 100 g/kg, T4=Garlic 100 g/kg, T5= Mixture of Thyme 30 g/kg + Rosemary 30 g/kg + Garlic 30 g/kg. S= Significant.

Table (3) shows the effect of a mixture of aromatic medicinal plants on the average body weight during the experimental period, as well as the initial weight, the final weight, and the percentage of weight gain in chicks fed on different groups of experimental diets, as well as the total feed consumption g/bird, as well as the feed conversion ratio of the bird.

It is evident from this study that the treatment group fed 100 mg of thyme and rosemary saw a considerable improvement in average body weight when compared to the control group and the other groups, with percentages of 252.76 and 282.16, respectively.

The use of thyme and various medicinal plants as nutritional supplements may positively affect the health and productivity of the animal [31].

Conversely, the outcomes demonstrated a noteworthy reduction in the rate of weight increase in the groups given thyme and rosemary as opposed to [32]. When sage, thyme, and rosemary extracts were added to the broiler chickens' food in the WG group, no discernible changes were seen. This is because the feed conversion rate of broiler birds in hot, humid tropical regions was marginally impacted by the various nutritional supplements. By adding thyme, birds that were subjected to prolonged heat stress showed a considerable improvement in their feed conversion ratio. According to [33], broilers on a diet containing thyme per kg of feed had a much higher body weight than those fed antibiotics.

Table 3: The influence of different levels of thyme, rosemary, and garlic and their combination on chicken growth performance (Mean± Standard error).

	Different dietary treatments				
parameters	T1	T2	T3	T4	T5
Initial live weight (g/bird)	284.80 ± 14.17^{b}	252.76 ± 12.77^{a}	282.16 ± 13.58^{a}	295.10 ± 15.28^{abc}	287.39 ± 14.88^{ab}
Final live weight (g/bird)	338.39±16.51	368.01 ± 16.51^{ab}	352 ± 16.31^{b}	330 ± 16.16^{a}	356 ± 16.51^{abc}
Total weight gain (g/bird)	1844.32 ± 28.9^{a}	1977.38 ± 22.20^{b}	1905.38 ± 21.05^{b}	1832.89 ± 15.80^{c}	1862.89 ± 12.80^{c}
Total feed intake (g/bird)	17154.00 ± 295.21^{a}	17374.00 ± 298.22^{ab}	15272.00 ± 284.68^{a}	16277.00 ± 290.32^{b}	19787.00 ± 350.96^{abc}
Feed conversion ratio (FCR)	1.9 ± 0.15^{b}	2.5 ± 0.16^{a}	2.1 ± 0.15^{c}	1.3 ± 0.12^{a}	2.3 ± 0.14^{ab}
		S	**S**	**S**	**S**

*a, b, c, Means with different superscripts in the same column differ significantly (P<0.05).T1= control, T2=Thyme 100 g/kg, T3= Rosemary 100 g/kg, T4=Garlic 100 g/kg, T5= Mixture of Thyme 30 g/kg + Rosemary 30 g/kg + Garlic 30 g/kg. S= Significant.

Table (4) indicates the effect of thyme, rosemary, and garlic on the live weight and weight after slaughter as well as the carcass. Through this table, it is noted that there is a significant difference between the different treatments compared to the control group, as there is an effect on the weight of the treatment fed on a mixture of garlic, thyme, and rosemary, where the highest significant difference was recorded at 330 grams. It was noted that the percentage of the bird's weight after slaughter was insignificantly affected by the different treatments compared to the control group.

Nonetheless, the trial findings verified that the control group, thyme group, and rosemary group, respectively, had a favorable numerical impact 252, 236, and 218.

After slaughter, there was a positive difference in the weight of the carcass in the treatment fed on a mixture of thyme, garlic, and rosemary compared to the control group, where it recorded a percentage of (156).

This is consistent with [34], who claimed that while the carcass improved with the administration of herbal extracts of garlic and thyme, the proportion of belly fat did not change significantly.

Table 4: The influence of different levels of thyme, rosemary, and garlic and their combination on chicken body weight pre-slaughter, after slaughter, and Hollow carcass (Mean± Standard error).

	Different dietary treatments				
Slaughter characteristics	T1	T2	T3	T4	T5
Pre-slaughter weight (g)	338.39±16.51	368.01±16.51^{ab}	352±16.31^{b}	330±16.16^{a}	356±16.51^{abc}
Carcass weight (g)	218±3.05^{a}	252±3.51^{a}	236±3.31^{a}	206±3.41^{abc}	242±3.50^{ab}
Hollow carcass	158±1.51	166±1.71^{ab}	164±1.61^{ab}	156±1.41^{a}	180±2.01^{abc}
		S	**S**	**S**	**S**

*a, b, c, Means with different superscripts in the same column differ significantly (P<0.05).T1= control, T2=Thyme 100 g/kg, T3= Rosemary 100 g/kg, T4=Garlic 100 g/kg, T5= Mixture of Thyme 30 g/kg + Rosemary 30 g/kg + Garlic 30 g/kg. S= Significant.

Table (5) shows the effect of thyme, rosemary, and garlic on the liver, gizzard, and spleen. Through this table, there are significant positive differences in some treatments compared to others, as the results showed that there are no significant differences between the different treatments at the level of $p < 0.05$, while the thyme treatment 100 mg/kg recorded a percentage of 14.10 in the liver and spleen, a percentage of 2.30 compared with the control group and other experimental groups, as there is no positive beneficial response to the inclusion of rosemary and garlic in the diets of other treatments in broiler chicks, which led to a decrease in the concentration of triglycerides in plasma and liver.

[35] studied the effect of some herbal extracts such as garlic and thyme. The nutritional treatments did not have any significant effect on the carcass components, including carcass production (%), breast (%), thigh (%), and abdominal fat pad (%).

[36] discovered that the weight of the liver and gizzards in broiler chickens, as well as the other carcass components, were not significantly impacted by the usage of two herbs, thyme and garlic extracts.

Table 5: The influence of different levels of thyme, rosemary, garlic and their combination on liver, gizzard, and spleen weights of chickens (Mean± Standard error).

	Different dietary treatments				
Item	T1	T2	T3	T4	T5
Liver (g)	9.80±0.23^{b}	14.10±0.48^{a}	10.01±0.34^{ab}	12.08±0.17	10.40±0.25^{abc}
Liver yield%	1.12±0.07	1.21±0.09^{a}	1.33±0.10^{a}	1.31±0.08^{a}	1.51±0.12^{ab}
Gizzard (g)	7.20±0.32^{b}	7.50±0.39^{ab}	8.70±0.26^{a}	6.90±0.30^{a}	9.70±0.55^{abc}
Gizzard yield%	1.60±0.11^{a}	1.75±0.09^{b}	1.81±0.15^{ab}	1.85±0.18	1.94±0.19
Spleen (g)	1.80±0.19	2.30±0.51^{a}	2.00±0.41^{b}	3.20±0.71^{ab}	0.90±0.05
Spleen yield%	0.52±0.09	0.81±0.15^{b}	0.61±0.11^{a}	0.88±0.29^{b}	0.21±0.04^{ab}

*a, b, c, Means with different superscripts in the same column differ significantly (P<0.05).T1= control, T2=Thyme 100 g/kg, T3= Rosemary 100 g/kg, T4=Garlic 100 g/kg, T5= Mixture of Thyme 30 g/kg+ Rosemary 30 g/kg + Garlic 30 g/kg. S= Significant.

Table (6) shows the effect of different levels of thyme, rosemary, and garlic on the heart, pancreas, and kidney. It is noted that through this table there are significant and insignificant differences between the different experimental treatments. The treatment containing a mixture of garlic, thyme, and rosemary affected the heart level, as this treatment recorded the highest significant difference compared to the control group and the other groups, as it recorded a percentage of 2.60 grams. The control group recorded the highest significant difference, as there was a slight increase in the weight of the pancreas, which recorded 0.80±0.09, respectively. [37] indicated that garlic and thyme extracts had no significant effect on the performance of broiler chickens, but had a positive effect on the functions of the kidneys, pancreas, and physiological activity by stimulating the activity of the internal enzyme and facilitating the absorption of nitrogen.

Table 6: The influence of different levels of thyme, rosemary, garlic, and their combination on heart, pancreas, and kidney weights of chickens (Mean± Standard error).

	Different dietary treatments				
Item	T1	T2	T3	T4	T5
Heart(g)	2.13±0.09	2.70±0.14^{b}	2.00±0.04	2.40±0.13^{b}	2.60±0.07^{a}
Heart yield%	0.41±0.02	0.42±0.02	0.48±0.02	0.49±0.02	0.50±0.02
Pancreas(g)	0.80±0.09^{a}	0.80±0.09^{b}	1.10±0.11	1.10±0.11^{b}	1.40±0.22^{abc}
Pancreas yield %	0.21±0.01^{a}	0.21±0.01	0.51±0.09^{b}	0.51±0.09	0.71±0.12^{a}
Kidney(g)	1.20±0.13	1.10±0.11^{c}	1.30±0.15	1.00±0.10	0.90±0.05
Kidney yield %	0.61±0.10^{b}	0.41±0.09^{a}	0.81±0.19^{b}	0.31±0.05	0.21±0.03^{a}

*a, b, c, Means with different superscripts in the same column differ significantly (P<0.05).T1= control, T2=Thyme 100 g/kg, T3= Rosemary 100 g/kg, T4=Garlic 100 g/kg, T5= Mixture of Thyme 30 g/kg+ Rosemary 30 g/kg + Garlic 30 g/kg. S= Significant.

Table (7) shows the effect of different levels of thyme, rosemary, and garlic on the small intestine and the length of the intestine as well as the length of the cecum and its weight in grams. It is noted that through this table there are significant and insignificant differences between the different experimental treatments.

No significant difference was observed in the weight of the intestine between the different groups respectively. This study showed that the herbal extract had no significant effect on the level of the intestine, as the herbal extract led to improvement in the carcass and the feed conversion factor, but it had no significant effect on the percentage of fat in the abdomen.

It found that broiler hens given herbal extract had a significant impact on the weight of the cecum, with varying percentages noted in comparison to the combination group [38].

Performance and carcass composition were not significantly impacted by the addition of garlic and thyme extracts; however, the percentage of cecal weight in groups given 100 mg of thyme, 100 mg of rosemary, and 100 mg of garlic was significantly impacted.

Table 7: The influence of different levels of thyme, rosemary, and garlic and their combination on the small intestine and caecum weights and their length in chickens (Mean± Standard error).

	Different dietary treatments				
Item	T1	T2	T3	T4	T5
Small intestine(g)	22.90±0.64^{a}	17.60±0.53^{ab}	14.90±0.33^{b}	13.30±0.21^{a}	19.90±0.62^{abc}
Small intestine yield %	3.10±0.19^{b}	2.19±0.21	1.80±0.08	1.50±0.08	2.86±0.09
Small intestine length(cm)	83.00±2.51	88.00±3.01^{b}	86.00±2.91^{a}	95.00±3.89^{ab}	89.00±3.21^{a}
Caecum(g)	4.90±0.72^{b}	5.10±0.91^{ab}	5.40±1.09^{ab}	2.50±0.22^{b}	3.50±0.42^{a}
Caecum yield %	2.10±0.08	2.18±0.09^{a}	2.25±0.18^{b}	2.35±0.42	2.75±0.74^{ab}
Caecum length(cm)	7.00±0.31^{a}	8.00±0.42^{a}	8.00±0.42^{a}	6.90±0.21^{b}	9.60±0.55^{ab}

*a, b, c, Means with different superscripts in the same column differ significantly (P<0.05).T1= control, T2=Thyme 100 g/kg, T3= Rosemary 100 g/kg, T4=Garlic 100 g/kg, T5= Mixture of Thyme 30 g/kg+ Rosemary 30 g/kg + Garlic 30 g/kg. S= Significant.

Conclusions

The findings of this investigation demonstrated that adding medicinal aromatic plants such as thyme, garlic and rosemary to poultry feed has a positive effect on feed consumption, weight gain, and feed conversion of birds in addition to various effects on the internal organs of poultry and the carcass body. The right amount of supplementation and method of action for medicinal plants need to be further investigated.

Reference

1. Onu, P. N., Madubuike, F. N., Onu, D. O., & Ekenyem, B. U. (2011). Performance and economic analysis of broiler starter chicks fed enzyme-supplemented sheep manure-based diets. *ARPN J Agric Biol Sci*, *6*, 14-1.
2. Guerrero-Legarreta, I. (2010). *Handbook of poultry science and technology, Volume 2: secondary processing*. John Wiley & Sons, Inc.
3. Thornton, P. K. (2010). Livestock production: recent trends, future prospects. Philosophical Transactions of the Royal Society B: Biological Sciences, 365(1554), 2853-2867.
4. Lee, K. W., Everts, H., & Beynen, A. C. (2004). Essential oils in broiler nutrition. *Int J Poult Sci*, *3*(12), 738-752.

5. Donoghue, D. J. (2003). Antibiotic residues in poultry tissues and eggs: human health concerns?. *Poultry science*, *82*(4), 618-621.
6. Osman, N.E., G. Talat, C. Mehmet, D. Bestami and U.G. Simsek, 2005. The effect of an essential oil mix derived from Oregano, Clove, and Anise on broiler performance. Int. J. Poult. Sci., 4: 879-884.
7. Bolukbasi, SC. and MK. Erhan. 2007. International Journal of Natural and Engineering Sciences 1: 55.
8. Alcicek A, Bozkurt M, Cabuk M. The effect of a mixture of herbal essential oils, an organic acid or a probiotic on broiler performance. South African Journal of Animal Sciences. 2004; 34(4):217-222.
9. Mitsch P, Zitterl-Eglseer K, Kohler B, Gabler C, Losa R, Zimpernik I *et al.* The Effect of Two Different Blends of Essential Oil Components on the Proliferation of Clostridium perfringens in the Intestines of Broiler Chickens, Poultry Science, Poultry Science. 2004; 83:669-675.
10. Katooli N, Maghsodlo R, Honari H, Razavi SE. Fungistatic activity of essential oil of thyme and eucalyptus against of postharvest and soilborne plant pathogenic fungi. Global Journal of Medicinal Plant Research. 2012; 1:1-4.
11. Abou-elkhair R, Khalid M Gaafar NM, Elbahy Mohamed AH, Hamada Mahboub DH, Sameh G *et al.* Bioactive effect of dietary supplementation with essential oils blend of oregano, thyme and garlic oils on performance of broilers infected with eimeria species. Global Veterinaria. 2014; 13(6):977-985.
12. Choi, I. H., Park, W. Y., & Kim, Y. J. (2010). Effects of dietary garlic powder and α-tocopherol supplementation on performance, serum cholesterol levels, and meat quality of chicken. *Poultry Science*, *89*(8), 1724-1731.
13. Al-Kassie, G. A. M.; Abd-Al-Jaleel, R. A. and Mohseen, A.M. 2011. The effect of a mixture of anise and rosemary on broiler performance. Agric. Biol. J. N. Am., 2: 1279-1282.
14. Aherne, S. A.; Kerry, J. P. and O'Brien, N. M. 2007. Effects of plant extracts on antioxidant status and oxidant-induced stress in Caco-2 cells. Brit. J. Nutr., 97: 321-328.
15. Al-Kassie, G. A. M. 2008. The Effect of Anise and Rosemary on Broiler Performance. Inter. J. Poult. Sci., 7: 243- 245.
16. El-Husseiny, O.; Shalash, S. M. and. Azouz, H. M. 2002. Response of broiler performance to diets containing hot pepper and/ or fenugreek at different metabolizable energy levels. Egypt. Poult. Sci., 22: 387-406.
17. Osman, M; Yakout, H. M.; Motawe, H. F. and Ezz El-Arab, W. F. 2010. Productive, physiological, immunological, and economical effects of supplementing natural feed additives to broiler diets. Egypt. Poult. Sci., 30: 25-53.
18. Leung, A. Y. and Foster, S. 1996. Encyclopedia of Common Natural ingredients Used in Food, Drugs and Cosmetics, 2nd Ed., John Wiley and sons, Inc., New York.
19. Alagawany, M. M., Farag, M. R., & Kuldeep Dhama, K. D. (2015). Nutritional and biological effects of turmeric (Curcuma longa) supplementation on performance, serum biochemical parameters and oxidative status of broiler chicks exposed to endosulfan in the diets.
20. Iwuji, T. C., Iheanacho, G. C., Ogamba, M. C., & Odunfa, O. A. (2022). RELATIONSHIP BETWEEN LIVE WEIGHT, INTERNAL ORGANS, AND BODY PART WEIGHTS OF BROILER CHICKENS. *Malaysian Animal Husbandry Journal*, *2*(2), 64-66.
21. Onibi, G. E., Adebisi, O. E., Fajemisin, A. N., & Adetunji, A. V. (2009). Response of broiler chickens in terms of performance and meat quality to garlic (Allium sativum) supplementation. *African Journal of Agricultural Research*, *4*(5), 511-517.
22. Rivlin, R. S. (2001). Historical perspective on the use of garlic. *The Journal of Nutrition*, *131*(3), 951S-954S.
23. Amagase, H., Petesch, B. L., Matsuura, H., Kasuga, S., & Itakura, Y. (2001). Intake of garlic and its bioactive components. *The Journal of nutrition*, *131*(3), 955S-962S.
24. Horton, G. M. J., Fennell, M. J., & Prasad, B. M. (1991). Effect of dietary garlic (Allium sativum) on performance, carcass composition and blood chemistry changes in broiler chickens. *Canadian Journal of Animal Science*, *71*(3), 939-942.
25. Gill, C. (2000). Botanical feed additives. *Feed. Int*, *21*, 14-17.
26. Omar, J. A., Hejazi, A., & Badran, R. (2016). Performance of broilers supplemented with natural herb extract. *Open Journal of Animal Sciences*, *6*(1), 68-74.
27. Bölükbaşi, Ş. C., & Erhan, M. K. (2007). Effect of Dietary Thyme (Thymus vulgaris) on Laying Hens Performance and Escherichia coli (E. coli) Concentration in Feces. *International Journal of Natural & Engineering Sciences*, *1*(2).
28. Lee, K. W., Everts, H., Kappert, H. J., Frehner, M., Losa, R., & Beynen, A. C. (2003). Effects of dietary essential oil components on growth performance, digestive enzymes and lipid metabolism in female broiler chickens. *British poultry science*, *44*(3), 450-457.

29. Stanaćev, V., Glamočić, D., Milošević, N., Puvača, N., Stanaćev, V., & Plavša, N. (2011). Effect of garlic (Allium sativum L.) in fattening chicks nutrition. *African Journal of Agricultural Research*, *6*(4), 943-948.
30. Windisch, W., Schedle, K., Plitzner, C., & Kroismayr, A. (2008). Use of phytogenic products as feed additives for swine and poultry. *Journal of animal science*, *86*(suppl_14), E140-E148.
31. Attia, Y. A., Al-Harthi, M. A., & Hassan, S. S. (2017). Turmeric (Curcuma longa Linn.) as a phytogenic growth promoter alternative for antibiotic and comparable to mannan oligosaccharides for broiler chicks. *Revista mexicana de ciencias pecuarias*, *8*(1), 11-21.
32. Hernandez, F., Madrid, J., Garcia, V., Orengo, J., & Megias, M. D. (2004). Influence of two plant extracts on broilers performance, digestibility, and digestive organ size. Poultry science, 83(2), 169-174.
33. Najafi, P., & Torki, M. (2010). Performance, blood metabolites and immunocompetaence of broiler. *J. Anim. Vet. Adv*, *9*(7), 1164-1168.
34. Alcicek, A. H. M. E. T., Bozkurt, M., & Çabuk, M. (2003). The effect of an essential oil combination derived from selected herbs growing wild in Turkey on broiler performance. *South African Journal of Animal Science*, *33*(2), 89-94.
35. Konjufca, V. H., Pesti, G. M., & Bakalli, R. I. (1997). Modulation of cholesterol levels in broiler meat by dietary garlic and copper. *Poultry science*, *76*(9), 1264-1271.
36. Sarica, S., Ciftci, A., Demir, E., Kilinc, K., & Yildirim, Y. (2005). Use of an antibiotic growth promoter and two herbal natural feed additives with and without exogenous enzymes in wheat based broiler diets. *South African Journal of Animal Science*, *35*(1), 61-72.
37. Cross, D. E., Acamovic, T., Deans, S. G., & McDevitt, R. M. (2002). The effects of dietary inclusion of herbs and their volatile oils on the performance of growing chickens. *British Poultry Science*, *43*, S33-S35.
38. Jamroz, D., & Kamel, C. (2002). Plant extracts enhance broiler performance. In non-ruminant nutrition: Antimicrobial agents and plant extracts on immunity, health and performance.