

## Effect of thyme extract on hematological factors and performance of broiler chickens

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### ABSTRACT

The prophylactic use of antibiotics in broiler feeds enhances growth rate and improved feed conversion ratio in poultry industry. In the European Union, the use of antibiotics for broilers has been limited to only antibiotics that are not used in human medicine. Therefore, in the last few years, uses of medicinal plants (essential oils) have been increased that because of their antimicrobial activity. This study was conducted to determine the effect of the addition of different levels of thyme, added to drinking water, on some hematological factors and Body weight gain (BW), feed conversion ratio (FCR), feed intake and mortality rate. Two hundred and forty, day-old broiler chicks (Ross-308) were divided into four equal groups (each group include 3 repetition). Experiment was as follow; a control group with no thyme and in other two groups, thyme extract was used 500 ppm and 1000 ppm and in last group feed was pellet and thyme was not used. Experiments were carried out for 42 days and thyme extract was used from day 7 to 42. Results showed that chicks fed with 1000 ppm thyme extract had significantly lower ( $p < 0.05$ ) feed intake, feed conversion ratio, and mortality rate followed by chicks fed with 500 ppm thyme extract and pellet group compared with control group, which showed the lowest performance. The highest BW was in pellet and 1000 ppm thyme group that was significantly different ( $p < 0.05$ ) from two other groups. Moreover, the chicks that get 500 and 1000 ppm thyme in drinking water had decreased ( $p < 0.05$ ) heterophils to lymphocyte ratio, this results showed that, increase of total bacterial count in other groups cause increase in heterophil numbers and due to that the heterophils to lymphocyte ratio increased in other groups and the highest increase was in pellet group which because of bacterial growth stress in that group. In conclusion, thyme extract could be considered as a potential natural growth promoter and have the advantage of inhibiting the growth of potential pathogens for poultry at the level of 1000 ppm.

**Keywords:** Thyme extract, Broiler, Performance, Hematological factors.

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### INTRODUCTION

The prophylactic use of antibiotics (as growth promoters) in broiler feeds lead to enhance growth rate and improved feed conversion ratio in poultry industry. In the European Union, the use of antibiotics for broilers has been limited to only antibiotics that are not used in human medicine. Therefore, in the last few years, uses of medicinal plants (essential oils) have been increased that because of their antimicrobial activity [10]. Thyme (*Thymus vulgaris* L.) is a popular medicinal plant mostly grown in Mediterranean regions and possesses antioxidants [23] and antibacterial

properties[32]. The major components of thyme essential oil are phenolic compounds such as thymol (44.4-58.1%), carvacrol (2.4-4.2%) and  $\gamma$ -terpinene (6.9-18.9%)[1, 6, 15, 19, 25]. The antimicrobial activity of EOs has been recognized and they have been extensively tested *in vitro* and *in vitro* against a wide range of pathogenic bacteria and fungi[12, 18, 20, 29, 30]. Animal trials have also demonstrated the promising effects of EOs against the colonization and proliferation of *Escherichia coli* [3, 7]. Recently researchers showed that, thyme oil only at high concentrations (500 mg/l) effective against *Clostridium perfringens*, *Streptococcus epidermis*, *Salmonella* serovars and at low concentrations (50 mg/l) effective against *Escherichia coli* [27]. It seems that main target of essential oils is cell membrane of bacterial cells [8] and because of that, gram-positive bacteria's are generally more sensitive to antibacterial activity of thyme oil than gram-negative bacteria's[20]. It has been suggested that lipophilic properties and chemical structures of essential oils can play a role in antimicrobial mechanism of them[9, 13]. The effects of thyme extract on broilers performance also was previously studied by other researchers [5, 14] and they confirmed that thyme oil effective in improvement of growth and decrease of feed conversion ratio.

The purpose of this study was to investigate the effect of thyme extract on the hematological factors and performance of broiler chickens.

## MATERIALS AND METHODS

### Animals and dietary treatments

The experiment used 240 day-old broiler chicks (Ross-308) that were randomly divided into four equal treatment groups with 3 replicates of 20 birds based on a completely randomized design. The dietary treatments consisted of the basal diet as control group that does not receive thyme (group 1) and in two other treatment groups, thyme extract was used 500 ppm (group 2) and 1000 ppm (group 3) and in last group feed was pellet and thyme was not used (group 4). Experiments were carried out for 42 days and thyme extract was used from day 7 to 42.

Chicks were raised on floor pens (100 × 200 × 80 cm) for 42 days and had free access to feed and water throughout the entire experimental period. The lighting program consisted of a period of 23 h light and 1 h of darkness. The ambient temperature was gradually decreased from 33 to 25°C on day 21 and was then kept constant.

### Performance parameters

Body weight and feed intake were recorded weekly and feed conversion ratio was calculated. Mortality was recorded as it occurred.

### Heterophil to lymphocyte ratio

In this experiment, heterophil to lymphocyte ratio and albumin to globulin ratio were measured as immune responses. At 42 days of age, five birds per replicate were selected without regard to sex and their blood samples were collected using with heparinized syringes. Immediately, thin smears were prepared from each blood sample and stained by Gimsa methods. One hundred leukocytes per sample were identified and counted by 100× oil immersion. Other types of leukocytes were not counted. heterophil to lymphocyte ratio was calculated by dividing the number of heterophils by the number of lymphocytes and recorded [2, 17, 28].

### Statistical analysis

Data were analysed by one-way ANOVA ( $p < 0.05$ ) with a completely randomized design. Parameters mean was compared with the Duncan's multiple range test. PASW SPSS (Version 18.0) statistical package was used for analyzing data.

## RESULTS AND DISCUSSION

Body weight (BW), feed conversion ratio (FCR), feed intake (FI), and mortality rate (MR) are presented in Table 1. Results showed that there were significant difference between groups and chicks fed with 1000 ppm thyme extract had significantly lower ( $p < 0.05$ ) feed intake, feed conversion ratio, and mortality rate followed by chicks fed with 500 ppm thyme extract and pellet group compared with control group, which showed the lowest performance. The highest BW was in pellet and 1000 ppm thyme group that was significantly different ( $p < 0.05$ ) from two other groups. Moreover, the chicks that get 500 and 1000 ppm thyme in drinking water had decreased ( $p < 0.05$ ) heterophil-to-lymphocyte ratio. The highest mortality rate was observed in control group (group 1), followed by the pellet group (group 4), and in group 3 (1000 ppm thyme) the mortality rate was lowest.

**Table 1. Effects of thyme extracts on body weight gain, feed conversion ratio, feed intake and mortality rate (Mean  $\pm$  Standard error)**

Group	BW	FCR	FI	MR	H/L ratio
(control) 1	2750 $\pm$ 8.66 <sup>a</sup>	2.10 $\pm$ 0.005 <sup>c</sup>	5775.10 $\pm$ 34.06 <sup>c</sup>	8.2 $\pm$ 0.11 <sup>d</sup>	0.48 $\pm$ 0.01 <sup>c</sup>
(500 ppm)2	2775 $\pm$ 5.77 <sup>ab</sup>	1.94 $\pm$ 0.008 <sup>b</sup>	5392.85 $\pm$ 35.57 <sup>ab</sup>	6.53 $\pm$ 0.28 <sup>b</sup>	0.31 $\pm$ 0.02 <sup>a</sup>
(1000ppm)3	2800 $\pm$ 14.43 <sup>bc</sup>	1.90 $\pm$ 0.01 <sup>a</sup>	5319.66 $\pm$ 4.91 <sup>a</sup>	5.5 $\pm$ 0.08 <sup>a</sup>	0.38 $\pm$ 0.03 <sup>ab</sup>
(pellet)4	2820 $\pm$ 11.54 <sup>c</sup>	1.95 $\pm$ 0.01 <sup>b</sup>	5499.26 $\pm$ 55.07 <sup>b</sup>	7.2 $\pm$ 0.05 <sup>c</sup>	0.55 $\pm$ 0.09 <sup>c</sup>

\*: Means within same column having different letters are significantly different ( $P < 0.05$ ).

Recently essential oils are used as feed supplements to improve growth performance of broilers. It was expected that supplementing extracted thyme oil would stimulate growth performance in the broilers, but research on essential oil yielded contradicting results [4, 11, 26]. However, the results of the present study are in agreement with previous observations that indicated essential oil that affect body weight gain, feed intake or feed efficiency in broilers. In the current experiment, supplementation with thyme oil in comparison to control diet significantly lowered feed Intake and FCR.

Through the experiment, in groups fed the thyme diet (particularly in 1000 ppm group), body weight gain ( $p < 0.05$ ) greater than broilers fed the control diets, but not broilers fed the pellet diet, and Feed Conversion Ratio decreased in groups fed thyme diet in comparison to control group ( $p < 0.05$ ). These results indicate that the 1000 ppm thyme had higher growth promoting efficacy than the 500 ppm thyme. This result agrees with those reported by AL-KASSIE, G. A. M. (2009), who noted that the chicks fed with 200 ppm essential oils derived from thyme had significantly higher feed intake, body weight gain and feed conversion ratio, compared with control group, which showed the lowest performance[4]. These results showed that thyme oil's added in broiler diets improved body weight gain, feed intake and feed conversion ratio, which may be due to active materials (thymol and carvacrol) in this plant which are considered as digestion stimulating factors, in addition to their antimicrobial activity against bacteria found in the intestine. Similar to our results, reported a significant enhancement of feed conversion ratio through the dietary addition of carvacrol [21] and a mixture of essential oils including oregano, cinnamon, thyme and capsicum [33]. On the other hand, other scientists observed that thyme essential oil have not significant effects on feed efficiency, and feed conversion ratio[31].

Thymol affect pathogenic bacteria by changing cell wall bacterial permeability leading to pore formation and osmotic shock and leakage of cytoplasm and its active contents outside the cell leading to death of them [22], the antimicrobial effect of thymol on these bacteria played on vital membrane ions of potassium and hydrogen equilibrium pumps [7]. Also Friedman, M., et. al., (2002), confirmed thymol and carvacrol antibacterial activities against *E.coli*, *S.enterica*, *C.jejuni*, and *L.monocytogenes* in vitro, and they noted that carvacrol, cinnamaldehyde, and thymol were most active against *E.coli*[16].

The chicks that get 500 and 1000 ppm thyme in drinking water had decreased ( $p < 0.05$ ) heterophil-to-lymphocyte ratio, this results showed that, increase of total bacterial count in other groups cause increase in heterophil numbers and due to that the heterophil-to-lymphocyte ratio increased in other groups and the highest increase was in pellet group which because of bacterial growth stress in that group. This results in agreement with Najafi, P. and Totki, M. (2010) that they reported chicks fed with thyme diet had significantly lower number of heterophils comparing to control group[24], and Toghyani, M. et. al., (2010), reported that the chicks fed with 5g/Kg thyme diet had lower heterophil to lymphocyte ratio comparing to control and antibiotic groups[31].

## CONCLUSION

Our data indicated that thyme affects the growth performance, and the 1000 ppm thyme had a higher growth promoter and improve FCR, and in the other hand 500 and 1000 ppm thyme cause decrease in heterophil to lymphocyte ratio because of decreasing heterophil numbers compared to control and pellet group.

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