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THYME LEAVES OR ITS EXTRACTED OIL FOR ENHANCING PRODUCTIVE AND PHYSIOLOGICAL STATUS OF BROILER CHICKENS

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ABSTRACT: An experiment was conducted to evaluate the effects of thyme dried leaves (TL), thyme extracted oil (TO) at two levels of each, and antibiotic (Lincomycin Hydrochloride, AB) incorporated to broiler diets on growth performance, carcass characteristics as well as bacteria enumeration, blood serum parameters and economic efficiency. One hundred and eighty unsexed one day old of age Hubbard chicks were weighed and randomly allocated into 6 treatments of 30 chicks in three replicates. The experimental diets were as follows; basal diet without supplementation (control, T_1), 1.5 g TL/kg (T_2), 3.0g TL/kg (T_3), 125 mg TO/kg (T_4), 250 mg TO/kg (T_5) and 1.0g AB/kg (T_6). The main results obtained can be summarized as follows: Chicks fed basal diets supplemented with TO (T_5) or AB (T_6) recorded an equal growth performance to chicks fed the control diet. However, they recorded significant lower values of feed conversion ratio. Carcass characteristics were non-significantly different for all treatment groups except abdominal fat % and thymus %. Blood parameters showed insignificant figures in most parameters. However, the addition of TO (T_5) or TL (T_3) has a significant effect on total plasma albumin or ALT concentration.

Key Words: : Thyme , Growth , Antibiotic , Bacteria and Broiler.

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Chicks fed TO (T_5) diets reflected the highest enzymes activity in stomach and ileum, the highest lactic acid bacteria and the lowest coli-form bacteria in small intestine. Supplementation of TL, TO or AB to basal diet reduced the economical efficiency by 2-21% as compared to the control diet. In conclusion, chicks fed on basal diet supplemented with 250 mg TO/kg diet gave an equal performance to control diet with improving bacterial media in small intestine and improving enzymes activity in stomach and ileum

INTRODUCTION

Recently, poultry production has increased due to the increase in population incomes and standards of living, therefore, poultry production has become one of the fastest growing industries in Egypt. Poultry feeds costs have considered the most expensive item (60 to 70%) of the whole production process (Mukhtar, 2007). Many attempts have been made by poultry nutritionists to improve their productive performance in order to reduce the cost of feeding by using dietary additives such as probiotics, enzymes, herbal medicinal plants and antibiotics. Antibiotics have been used as feed additives for decades, but many countries tended to prohibit the using of antibiotics as growth promoters because of their side effect on both birds and human health. In a study by Witte (1998) showed that, the extensive use of antibiotics in animal production has increased the risk of development of resistance in human and animal pathogens.

As a result, the natural additives such as spices, herbs and their extract are known from medicine to exert beneficial action within the digestive tract (Chrubasik et al., 2005). These additives are given to birds to improve their physiological and productive performance under normal or stress conditions (Tollba and Hassan, 2003). Thyme (Thymus Vulgaris L.TL) is one of the herbs that provide substantial amount of flavonoids which have health promoting properties, as antioxidants, as anti-inflammatory and antitumor agents (Craig, 1999). Herbal growth promoter (TL) had significant improvement of live body weight and feed conversion of broilers (Tollba and Hassan, 2003) in ducks (Ghazalah and Ibrahim, 1996) and in Japanese quail (Abd El-Latif et al., 2002). Thyme Oil (TO), as the dried leaves, is also used for the same purpose. Deighton et al., (1993) stated that thyme oil has phenolic components which are primarily responsible for its antioxidant activity. On the other hand, it provide a powerful means for inhibiting mold growth and aflatoxin production due to the presence of active materials known as thymal and carvacrol (Rao et al., 1985). Aktug and Karapinar

(1986) reported that TL and To had inhibitory effect on the growth of Salmonella Typhimurium, Staphyloccus Aureus and Vibrio Parahaemolytieus.

The aim of the present trial was to study the effects of thyme dried leaves (TL), Thyme Oil (TO) in comparing with antibiotic (Lincomycin Hydrochloride) incorporation in broiler diets on growth performance, carcass characteristics, bacteria enumeration, blood plasma parameters and economic efficiency.

MATERIALS AND METHODS

The experimental study was carried out at Poultry Experimental Unit, Agricultural Experiment and Research Station at Shalakan, Faculty of Agriculture, Ain Shams University, Egypt. It was designed to investigate a comparison between antibiotic (Lincomycin Hydrochloride, AB) and natural additives (thyme leaves, TL or thyme oil, TO) as growth promoters in Hubbard broiler diets.

A total number of 180 unsexed one day-old unsexed Hubbard chicks were fed on 23.12% CP and 3071 Kcal ME/kg starter diet (0-21 days), then fed on grower diet 21.13% CP and 3045 Kcal ME/kg from (22-35 days) to cover all recommended nutrient requirements according to NRC (1994). Chicks were individually weighed (approximately 44.5 g/chicks) and randomly distributed into 6 groups each in three replicates of 10 chicks each and randomly allocated into battery brooders to 6 dietary treatments(6 X 3 X 10). Chicks in all treatments were kept under similar conditions of management. Chicks groups were received feed and water ad libitum for 24 hours photoperiod. During each specific feeding phase, the 1st groups of chicks were fed the basal diet without any supplementation (T_1) while the 2nd, 3rd, 4th, 5th and 6th groups were fed the same basal diet supplemented with 1.5 g TL (T_2), 3.0 g TL (T_3), 125 mg TO (T_4), 250 mg TO (T_5) and 1.0 g AB (T_6) per kg diets, respectively. The composition and calculated analysis of the experimental diets with different feed additives are shown in Table (1 and 2).

At the end of experiment, (35 days old), three birds were randomly taken from each treatment group and slaughtered. The percentages of carcass, liver, heart, gizzard, giblets edible parts and abdominal fat were weighted and calculated as carcass characteristics. Individual blood samples were collected in dry clean centrifuge tubes from the slaughtered birds and serum was separated by centrifugation at 3000 rpm for 15 min. and assigned for subsequent determination. Quantitative determination of blood serum was included the following: total proteins, albumin, globulins

(determined by subtraction the value of albumin for the sample from its corresponding value for total proteins), creatinine, cholesterol and liver enzymatic activity (AST and ALT) concentrations by using Atomic Absorption spectrophotometer and suitable commercial diagnostic kits following the same steps as described by manufactures (Bio-Diagnostics company, Egypt).

Intestine was removed and the digest contents of this intestinal segment (1 g) were collected and homogenized with 10 ml phosphate buffer solution. The digest specimens were sent packed on ice to the laboratory (Microbiological Laboratory, MERCIN, Faculty of Agriculture, Ain Shams University) for enumeration of total bacteria, E. coli and Lactobacilli spp. The segments of digestive tract (stomach and intestine) were emptied by gentle squeezing, contents of individual segments were taken and mixed and about 1g of the mixed content was immediately diluted with 10 ml of distilled water. All samples were centrifuged for 10 minutes. The supernatant fluid was taken and stored in sealed bottles at -20°C until analyzed. Enzymes activity in digestive content of stomach and intestine of chicks were determined by method of Osman (1982) for amylase and Malik and Singh (1982) for protease.

At the time of slaughter, samples of 1 cm in length from small intestine were taken and fixed in 10% buffered neutral formaldehyde solution. Then slides were prepared by tissues sectioning and staining with hematoxylin and eosin for histological investigations. An economic efficiency was calculated as net return/total cost. Data were analyzed statistically, using the statistical analysis system (SAS, 2001) and Duncan, Multiple Range Test (1955).

RESULTS AND DISCUSIONS

Productive performance: Live body weight and daily weight gain:

The live body weight and daily weight gain of broiler as affected by dietary treatments are illustrated in Table (3). It is worth to note that chicks fed (TL) diets (T_2) during studied periods (4-5 and 0-5 weeks) reflected the lowest significant ($P<0.05$) results in both live body weight and daily weight gain compared with control treatment (T_1). However, during the starting period (0-3 weeks), chicks insignificantly decreased body weight by 3.9% (848.41 versus 882.73 g) compared with the control group (T_1). On the other hand, chicks fed higher levels of TL (T3) or TO (T_5) and AB gave slightly higher live body weight (1815.90, 1815.32 and 1808.96 g respectively) compared to those fed diets containing lower levels of TL (T_2)

and TO (T_4), being 1708.40 and 1744.25 g respectively, the differences were statistically not significant. Daily weight gain showed the same trend since birds fed control diet (T_1) had more increase compared with those fed other treatments (T2-6) through the whole experimental period (0-5 weeks). The corresponding values were 51.50 versus (47.57- 50.62 g) with insignificant differences between treatments except (T_2). In the same order, the worst daily weight gain was detected with T2 (47.57 g) or T4 (48.59 g) while the best value was detected by the birds fed the control diet (51.50 g) and the differences failed to be significant. During the finishing period (4-5 weeks), chicks fed low levels of TL (T2) or TO (T4) were significantly ($P<0.05$) lower in daily weight gain than control (T1) and the relative reduction in daily weight gain were 7.38 g (10.7%) or 7.31 g (10.6%) respectively as shown in Table (3). However, the depression in growth performance was more pronounced during growing rather than starting periods.

Feed consumption and Feed conversion:Data in Table (3) indicate that daily feed consumption per bird (g/d) was insignificantly decreased during whole and growing experimental periods by addition of TO (250 mg/kg diets, T5) or AB (1.0g / kg diets, T6) to experimental treatments compared with those fed other dietary treatments. The decrease in feed consumption was more pronounced during growing period (4-5 weeks) being 9.9 and 9.4%) while it was only 1.5 and 1.9% during starting period (0-3 weeks) compared to the control group (T_1) but without significant differences. In the same order, the figures of daily feed consumption indicated significant differences between birds fed diets containing AB (T6) compared with those fed TL (T3) diets during the starting period (0-3 weeks). The corresponding figures were 49.57 versus 53.56 (g).

Feed conversion ratio (FCR) showed the same trend since chicks fed TO (T_5) or AB (T_6) were more efficient in converting their food into body weight gain compared with those fed other dietary treatments (T_{1-4}) through the whole experimental period (0-5 weeks). In the same order, the figures of feed conversion ratio indicated significant differences between dietary treatments (T_{1-6}) throughout different experimental periods. During starter period, the addition of TL, TO or AB to experimental treatments (T_{2-6}) resulted to significantly increase FCR compared with those fed the control diet (T_1). However, the best FCR detected by chicks fed the control diet (1.26). While the worst FCR was calculated for chicks fed

TL diets T2 (1.35) and T3 (1.34). these differences were statistically significant.

Health Condition and Mortality Rate:Under the condition of the present study, all chicks appeared healthy and the total mortality rate was 0.0% during the total experimental period (0-5 weeks), without any differences among treatments. Hassan et al. (2004) and Eisenberg et al. (1993) reported that herbal medicine contain natural substances that can promote health and alleviate illness and mortality rate decreased in chicks fed diets supplemented with herbal preparations as compared to un-supplemented ones.

The reduction in body weight and daily weight gain may be related to the levels of active ingredients or toxicity (Arshad et al., 2008). These results were in contrast with results obtained by Tollba et al. (2010) who stated that essential oils derived from spices and herbs had positive effects on growth performance in chicks in terms of weight gain, feed consumption, viability and feed: gain ratio compared to the control group. They indicated that these effects became more pronounced when chickens were subjected to stressful conditions such as less digestible diet and/or a less clean attributed to the properties of essential oils that could act not only as antibacterial, antiprotozoal and antifungal but also as antioxidants. These results are in agreement with those obtained by Shabaan (2012) who stated that incorporating thyme or cumin seeds either alone or in combination to low energy broiler diets gave significant differences in body weight gain during overall experimental period while, feed conversion ratio was not significant difference. In general, it seemed that addition of thyme or cumin seeds reflected the lowest body weight gain while the mixture of (0.15) thyme and (0.15) cumin recorded the highest figures compared with the control group and the differences failed to be significant.

Carcass characteristics:Table (4) shows that experimental treatments with different dietary treatments (T_{2-6}) had no significant effect on most studied parameters on carcass characteristics when compared with those of the control (T_1). The corresponding values for dressing percentages ranged between 67.42 and 69.00%, while parts which ready to cook (carcass weight + giblets weight) ranged between 71.87 and 73.18%.

On the other hand, chicks fed TL (T3) or TO (T5) diets gave the lowest figures of (67.42 or 67.57%) and (71.53 or 71.87%) for dressing and ready to cook percentages, respectively and the differences were insignificant compared with the other experimental treatments. In the same order,

the figure of abdominal fat % indicated significant differences ranged between 0.64% and 1.56%. Although, chicks fed diets contained TO (T_5) gave the highest figure while, chicks fed TO (T_4), AB (T_6) or TL (T_3) had the lowest figures. These differences among treatments were significant.

Concerning Gastrointestinal Tract Length GITL (cm), the obtained results showed that there were insignificant differences in (GITL), GITL / kg body weight and GITL % for chicks at the end of 5 weeks of age (Table 4). The corresponding values for GITL ranged between 136.25 and 153.75 cm, while GITL /kg LBW ranged between 71.66 and 85.36. Chicks fed control diets (T_1) showed the lowest figures while; chicks fed TL (T2) had the highest figures. The differences among treatments were not significant.

Lymphoid Organs:Concerning lymphoid organs (Thymus, bursa and spleen), it was noticed that chicks fed diets supplemented with TL at the low level (T2) had significant lower thymus % than those fed supplementation with TL at high level (T_3) or TO at low level (T4). The corresponding figures were 0.40, 0.60 and 0.65%, respectively. On the other hand, chicks fed different experimental diets (T2-6) had no significant effect on spleen % and bursa % compared with the control (T1). These results are in agreement with those obtained by Ghorban et al. (2013) and Nematallah et al., (2014), who reported that adding different herbal plants or spices to broiler diets had no effect on carcass characteristics. On the other hand, these findings are in contrast with results obtained by Lee et al. (2004) & Hernandez et al. (2004).

Findings of Al-Kassie (2009), Tollba et al. (2010) and Shabaan (2012) showed that dressing % of broiler was significantly higher by supplementing different levels of herbal feed additives or herbal plant extracts. It may be due to the stimulatory effects of herbal plants on pancreatic secretions such as digestive enzymes which help to digest and absorb more amino acids form the digestive tract and thereby improve carcass traits as reported by Mansoub (2011).

Blood plasma parameters:Results concerned serum total proteins, globulins, creatinine, cholesterol and AST were not significantly different among treatments (Table 5). Results showed that feeding TO at high level (T5) results in significant decrease in albumin concentration as compared to control diet (T1) and the corresponding values were 3.55 and 4.15 respectively. Regarding ALT concentration, it worth to note that chicks

fed AB diet (T_6) showed the highest concentration (26.04) while, chicks fed control (T1) or (T3) diets had the lowest figures being 17.20 and 17.95, respectively. The differences among treatments were significant. These results disagree with Tollba et al. (2010) who suggested that the addition of aromatic herbal extract to the diets increased (P<0.05) total proteins as well as albumin and globulins compared to un-supplemented control group. These increases maybe due to impacting bird nutrition metabolism. These results are in general agreement with those reported by El-Faham et al. (2014) who reported that blood parameters showed insignificant figures in most parameters. However, uric acid and ALP activity differed significantly (P<0.05) for using some natural feed additives to substitute antibiotic in broiler diets. These results disagree with those obtained with Tollba et al. (2010) who suggested that the addition of aromatic herbal extract to the diets increased (P<0.05) total proteins as well as albumin and globulins compared to control group under cold environmental temperatures.

Intestinal enzyme activity:Significant differences between some intestinal enzyme activity (Amylase and protease) in both stomach and ileum were recorded by chicks fed different dietary treatments (Table 7). It was observed that chicks fed control diet (T1) recorded the lowest values with significant differences compared to the experimental treatments (T2-6). The obtained data showed that chicks fed TO diet at high level (T5) reflected the highest enzymes activity % in both stomach and ileum compared with other treatments. However, stomach amylase increased by (10.15% versus 0.27%) and ileum amylase increased by (163.29% versus 31.39%) compared with those chicks fed control diets (T1). Stomach protease and ileum protease showed similar trend (65.67% versus 9.54%) and (30.54% versus 6.66%) respectively, the differences between the two treatments were significant. Moreover, feeding diets contained high levels of TO (T_5) or TL (T3) gave the highest levels of enzymes activity % compared with diets contained other low levels (T_2 or T_4). However, the differences among treatments were significant. A possible explanation of that may be due to the fact that herbal plants and essential oil extracts have stimulatory effects on pancreatic secretions such as digestive enzymes which help to digest and absorb more amino acids form the digestive tract (Lji et al., 2001 and Mansoub 2011). Similar observations were reported by Lewis et al. (2003) and Demir et al. (2008). They concluded that herbs and essential oils extracts could be used as natural alternatives to antibiotic as growth

promoters in poultry nutrient due to their bio-active constituents possess abroad antimicrobial activity, and appetite and digestion stimulating effects.

Intestinal microbial count:Means of total count, coli-form and lactic acid bacteria counts in intestinal broiler chicks fed different dietary treatments are given in Table (7). It is noted that chicks fed AB diets (T6) during studies period (0-5 weeks) reflected the lowest figure in total bacteria count compared with the other treatments (T_1-T_5) and total bacteria decreased by 4.8% (6.37 versus 6.69) compared with that of control group (T_1). On the other hand, the obtained data showed that differences in coli-form count and lactic acid count were recorded among treatments. Chicks fed TO diets (T_5) reflected the lowest coli-form count and highest lactic acid count compared with those of other treatments. However, coli form bacteria decreased by 7.2% (6.61% versus 7.12%) compared with chicks fed control diet (T_1) and lactic acid bacteria were increased by 234.5% versus 2.00%). The growth promoting effect of TO on beneficial bacteria (Lactic acid) and its growth inhibiting effect on harmful bacteria (coli-form) in beneficial in regulating intestinal micro-ecological balance. The beneficial effect of TO can confer protection against potential enter pathogenic bacteria and prevent or cure intestinal diseases.

The same trend was reported with Ali et al. (2008). They reported that Gram positive bacteria are more sensitive to herbs compounds. Also, Spais et al. (2002) found that a commercial feed additive containing herb extracts and organic acids exerts a growth promoting effect comparable to that of flavomycin. Moreover, the positive effects of these additives may be explain based on herbal plants and herbal extracts that have appetite effect (Hernandez et al., 2004, Abou-Sekken et al., 2007) and increased production of digestive enzymes through enhanced liver functions (Williams and Losa, 2001) or antimicrobial activity against pathogenic bacteria which improve the efficiency of feed utilization (Ghazalah and Ibrahim, 1996).

Histological investigation:Microscopically, concerning sections of intestine, in general, villi and Crypts of Liberkuhn have improvement in chicks that fed on different dietary supplementations than those in control group (Fig.1). Crypts are known to secrete fluids containing different vital substances essential for the internal micro-environment of the small intestine segments (Hodges, 1974). The Figure revealed that villi length and thickness are improved and enlarged in treated groups than control one. These improvement lead

to increase in nutrient absorption from intestine wall. The findings of Roberfroid (2000) and Pelicano, et al. (2005) are in agreement with the present results. They reported positive effects of prebiotics on villi height and the structure of intestinal mucosa.

Concerning liver sections obtained from different liver of chicken fed control and dietary treatments revealed no histological changes (Fig, 2). The size of central vein and the hepatocytes arrangement indicates an ideal structure of the liver. Also, liver sections showed normal hepatic parynchema. On the other side, treatment groups revealed an improvement in hepatocytes. The treatment which fed 3g thyme leaves showed less dark stained lymphocytic cells aggregations surrounding or near the central veins and that means that treatment group may be increased the immunity of the chicken.

Finally, these observations support our results concerning performance where growth performance of the treated groups was improved without any adverse effects on liver and on intestine histology.

Economic Evaluation: Data for economical evaluation are summarized in Table (8). The results of net return (NR) economical efficiency (EE) and relative economic efficiency (REE) estimated for experimental diets are based on the recent of local market for feed ingredients and selling price of live broiler chicks. Chicks fed control diets had the best economical and relative efficiency values being 50.94 and 100% respectively. This may be due to total feed cost / chick and highest body weight. Whereas, chicks fed diet contained TL (T_2) had the lowest corresponding values Being 40.18 and 79%, respectively. The relative efficiency (REE) varied between 40.18 to 50.94%. On the other hand, and in general, using TL or TO or AB particular (T_2, T_3 or T_4, T_5 and T_6) reduced NR, EE and REE of broiler chicks compared with those fed the control diet (T_1) during the total experimental period (0-5 weeks) and the corresponding reduction values in REE were 21, 7, 16, 5 and 2%, respectively. Ibrahim et al. (2005) noted that the economical efficiency % showed descending value for rabbit treatment groups which received some medicinal plants as feed additives. The opposite was reported by Abdel-Malak et al. (1995), Abd El-Azeem (2002) and Shabaan (2012). They reported increase in economic efficiency when using herbs and medicinal plants for broiler diets.

In conclusion, chicks fed on basal diet supplemented with 250 mg TO/kg diet gave an equal performance to control diet with improving bacterial media in small

intestine and improving enzymes activity in stomach and ileum.

Table (1): Feed ingredients and calculated analyses of basal diets:

Ingredients %	Dietary Treatments	
	Starter	**Grower**
Yellow Corn	46.45	54.44
Soybean meal 44 %	36.20	30.15
Full Fat Soybean	9.00	9.00
Soybean & Sunflower Oil	3.65	2.00
Limestone	1.60	1.48
Salt (NaCl)	1.85	1.68
Mono-cal-phosphate	0.08	0.22
DL Methionine	0.34	0.20
Lysine	0.40	0.40
Premix *	0.30	0.30
Choline Cloride 50%	0.13	0.13
Total	100	100
Calculated analysis		
Crude Protein%	23.12	21.13
ME Kcal/Kg diet	3071	3045
Calcium%	1.02	0.93
Non-Phytate-P%	0.50	0.46
Lysine %	1.39	1.39
Methionine %	0.69	0.53
Methionine & Cystine %	1.06	0.88
Price/ Ton (L.E.)	3775	3473

*The premix contains: Vitamins: A: 12000000 IU; Vit. D3 2000000 IU; E: 10000 mg; K3: 2000 mg; B1:1000 mg; B2: 5000 mg; B6:1500 mg; B12: 10 mg; Biotin: 50 mg; Coline chloride: 250000 mg; Pantothenic acid: 10000 mg; Nicotinic acid: 30000 mg; Folic acid: 1000 mg; Minerals: Mn: 60000 mg; Zn: 50000 mg; Fe: 30000 mg; Cu: 10000 mg; I: 1000 mg; Se: 100 mg and Co: 100 mg.

Table(2): Feed additives in starter and grower basal diets

Ingredients	Dietary Treatments					
	1	**2**	**3**	**4**	**5**	**6**
Starter (0-3 weeks)						
Additives	-	Thyme Leaves15 g/ Kg	ThymeLeave3.0 g/ Kg	ThymeOil125mg/Kg	Thyme Oil250 mg/ Kg	Antibiotics1.0 g/ Kg
Price/ Ton (L.E.)	3775	3799	3823	3900	4025	3935
Grower (4 - 5 weeks)						
Additives	-	Thyme Leaves1.5 g/ Kg	Thyme Leaves3.0 g/ Kg	Thyme Oil125 mg/ Kg	Thyme Oil250 mg/ Kg	Antibiotics1.0 g/ Kg
Price/ Ton (L.E.)	3468	3492	3516	3593	3718	3628

Table (3): Effect of different dietary treatments on productive performance.

Items	Treatments						
	1	**2**	**3**	**4**	**5**	**6**	**Sig.**
Live body weight (g)							
3 weeks	882.73±9.71	848.41±3.27	879.09±13.12	883.18±0.52	855.00±10.23	847.27 ±20.73	NS
5 weeks	1846.00^{a}±5.66	1708.40^{b}±8.36	1815.90^{ab}±26.03	1744.25^{ab}±14.28	1815.32^{ab}±32.98	1808.96^{ab}±84.15	*
Daily weight gain (g)							
0–3 weeks	39.97±0.46	38.33±0.15	39.79±0.62	39.99±0.02	38.65±0.48	38.28±0.98	NS
4–5 weeks	68.81^{a}±0.28	61.43^{b}±0.36	66.91^{ab}±0.92	61.50^{b}±0.98	68.59^{a}±1.62	68.69^{a}±4.52	*
0–5 weeks	51.50^{a}±0.16	47.57^{b}±0.23	50.64^{ab}±0.74	48.59^{ab}±0.40	50.62^{ab}±0.94	50.44 ^{ab} ±2.40	*
Daily feed consumption (g)							
0–3 weeks	50.52^{ab}±2.46	51.59^{ab}±0.43	53.56^{a}±0.87	52.22^{ab}±0.31	49.75^{ab}±0.59	49.57^{b}±0.52	*
4–5 weeks	123.62±3.01	119.41±3.61	119.04±1.86	113.05±1.88	111.39±3.46	112.04±8.10	NS
0–5 weeks	79.76±2.68	78.71±1.71	79.75±1.27	76.55±0.94	74.40±1.74	74.56±3.55	NS
Feed conversion ratio (g feed/ g gain)							
0–3 weeks	1.26^{b}±0.04	1.35^{a}±0.01	1.34^{a}±0.01	1.30^{ab}±0.01	1.29^{ab}±0.01	1.29^{ab}±0.02	*
4–5 weeks	1.80^{b}±0.05	1.94^{a}±0.07	1.77^{b}±0.01	1.84^{ab}±0.01	1.62^{c}±0.01	1.63^{c}±0.01	**
0–5 weeks	1.55^{bc}±0.04	1.65^{a}±0.01	1.57^{ab}±0.01	1.57^{ab}±0.01	1.47^{c}±0.01	1.48^{c}±0.01	**

$^{a, b}$ Means within the same row with different superscripts are significant1y different. Sig. = Significance, * ($P \leq 0.05$). NS = Non Significant

Table (4): Effect of different dietary treatments on some of carcass characteristics at 5 weeks.

Items	Treatments						
Carcass Characteristics	**1**	**2**	**3**	**4**	**5**	**6**	**Sig.**
Live Body weight LBW (g)	1901.25^{a}±78.13	1801.25^{ab}±35.35	1871.75^{ab}±17.59	1753.25^{b}±33.99	1821.75^{ab}±10.27	1858.25^{ab}±50.18	*
Carcass weight (g)	1304.75±46.60	1235.50±22.06	1262.75±29.33	1208.25±36.83	1231.00±23.94	1281.75 ±28.15	NS
Dressing %	68.67±0.71	68.60±0.33	67.42±0.93	68.86±0.94	67.57±1.23	69.00±0.37	NS
Abdominal Fat %	1.18^{ab}±0.29	1.22^{ab}±0.38	0.77^{b}±0.16	0.49^{b}±0.11	1.56^{a}±0.06	0.64^{b}±0.19	*
Liver %	2.67±0.18	2.91±0.29	2.29±0.31	2.41±0.04	2.33±0.14	2.26±0.07	NS
Gizzard %	1.25±0.06	1.13±0.06	1.32±0.17	1.10±0.11	1.35±0.01	1.12±0.12	NS
Heart %	0.51±0.02	0.53±0.04	0.50±0.02	0.52±0.03	0.61±0.07	0.52±0.05	NS
Giblets %#	4.44±0.17	4.58±0.33	4.11±0.31	4.04±0.18	4.30±0.22	3.91±0.16	NS
Lymphoid organs:							
Spleen %	0.13±0.03	0.09±0.01	0.13±0.02	0.08±0.01	0.13±0.01	0.10±0.01	NS
Thymus %	0.55^{ab}±0.06	0.40^{c}±0.02	0.60^{a}±0.02	0.65^{a}±0.06	0.44^{bc}±0.06	0.57^{ab}±0.02	**
Bursa %	0.07±0.02	0.08±0.03	0.08±0.01	0.06±0.01	0.09±0.01	0.08±0.01	NS
GIT Length (cm)	136.25±4.73	153.75±15.62	151.75±12.91	142.00±5.11	145.00±7.34	146.75±3.32	NS
GIT Length cm/Kg LBW %	71.66 100	85.36 119	81.07 113	80.99 113	79.59 111	78.97 110	

a, b Means within the same row with different superscripts are significant1y different. Sig. = Significance, ** (P≤0.01), * (P≤0.05).
NS = Non Significant.
# Giblets = Liver + Gizzard + Heart

Table (5): Effect of different dietary treatments on some blood parameters at 5 weeks.

Items	Treatments						
Blood Parameters	**1**	**2**	**3**	**4**	**5**	**6**	**Sig.**
Total Proteins (g/ dl)	6.43±0.43	6.76±0.73	7.80±0.63	7.54±0.77	6.60±0.52	7.35±0.32	NS
Albumin (g/ dl)	4.15^{a}±0.24	3.67^{ab}±0.20	4.13^{a}±0.01	3.64^{ab}±0.21	3.55^{b}±0.08	3.94^{ab}±0.06	*
Globulins (g/ dl)	2.28±0.42	3.09±0.57	3.67±0.62	3.89±0.72	3.05±0.45	3.40±0.36	NS
Creatinine (mg/ dl)	1.29±0.38	1.63±0.36	0.69±0.2	1.25±0.30	1.37±0.32	0.89±0.11	NS
Cholesterol (mg/ dl)	167.50±1393	161.66±5.16	156.66±11.54	175.00±9.41	178.66±18.80	176.00±24.74	NS
AST (RFU/ dl)	40.93±3.12	37.00±3.50	38.61±1.35	33.78±2.76	38.80±2.45	45.01±6.36	NS
ALT (RFU/ dl)	17.20^{b}±2.92	21.94^{ab}±2.64	17.95^{b}±2.28	21.43^{ab}±2.64	21.34^{ab}±2.29	26.04^{a}±0.24	*

$^{a, b, c}$ Means within the same row with different superscripts are significant1y different. Sig. = Significance, * ($P \leq 0.05$). NS = Non Significant.

Table (6): Effect of different dietary treatments on some intestinal enzyme activity at 5 weeks.

Items	Treatments						
Enzyme Activity %	**1**	**2**	**3**	**4**	**5**	**6**	**Sig.**
Stomach Amylase	0.27^{d}±0.03	2.83^{c}±0.21	3.59^{c}±0.08	3.56^{c}±0.25	10.15^{a}±0.48	7.04^{b}±0.07	**
Stomach Protease	9.54^{e}±0.34	30.51^{c}±0.67	40.76^{b}±0.66	40.62^{b}±0.92	65.67^{a}±2.29	16.00^{d}±0.37	**
Ilium Amylase	31.39^{e}±3.70	75.35^{c}±0.60	90.31^{b}±1.17	90.49^{b}±0.54	163.29^{a}±4.79	40.38^{d}±0.55	**
Ilium Protease	6.66^{d}±0.82	12.12^{c}±0.18	15.90^{b}±0.11	15.82^{b}±0.26	30.54^{a}±1.07	8.06^{d}±0.04	**

$^{a, b, c}$ Means within the same row with different superscripts are significant1y different. Sig. = Significance ** ($P \leq 0.01$), NS = Non Significant.

Table (7): Effect of different dietary treatments on intestinal bacterial count at 5 weeks.

Items	Treatments					
	1	**2**	**3**	**4**	**5**	**6**
	Control	TL 1.5 g/ Kg	TL 3.0 g/ Kg	TO 125 mg/ Kg	TO 250 mg/ Kg	AB 1 g/Kg
Total Count CFU/g $X10^6$	6.69	6.50	6.76	6.66	6.74	6.37
Coli-form Count CFU/g $X10^6$	7.12	6.68	6.82	6.98	6.61	7.06
Lactic acid Count CFU/g $X10^6$	2.00	3.90	3.97	4.18	4.69	3.43

Table (8): Effect of different dietary treatments on economic traits.

Items	Treatments					
Economic Traits	**1**	**2**	**3**	**4**	**5**	**6**
Average Feed Intake (Kg)	2.79	2.75	2.79	2.68	2.60	2.61
Feed Cost (LE)	10.01	9.95	10.16	9.96	10.00	9.79
Total Cost **	16.51	16.45	16.66	16.46	16.50	16.29
Live body Weight (Kg)	1.80	1.66	1.77	1.70	1.77	1.76
Total Return (LE)*	24.92	23.06	24.51	23.54	24.51	24.42
Net Return (LE)	8.41	6.61	7.85	7.08	8.00	8.13
Economic Efficiency	149.56	131.97	141.30	136.35	145.04	149.52
Performance Index [1]	119.42	103.39	115.31	110.73	123.52	122.39
Production Efficiency Factor [2]	341.21	281.49	314.70	302.06	352.92	334.64

1: North (1981), 2: Emmert (2000), * According to the local price of Kg LBW which was 13.50 L.E.

** Total Cost = cost of feeding + fixed cost (price of on day live chick, labor, medication, …..etc)

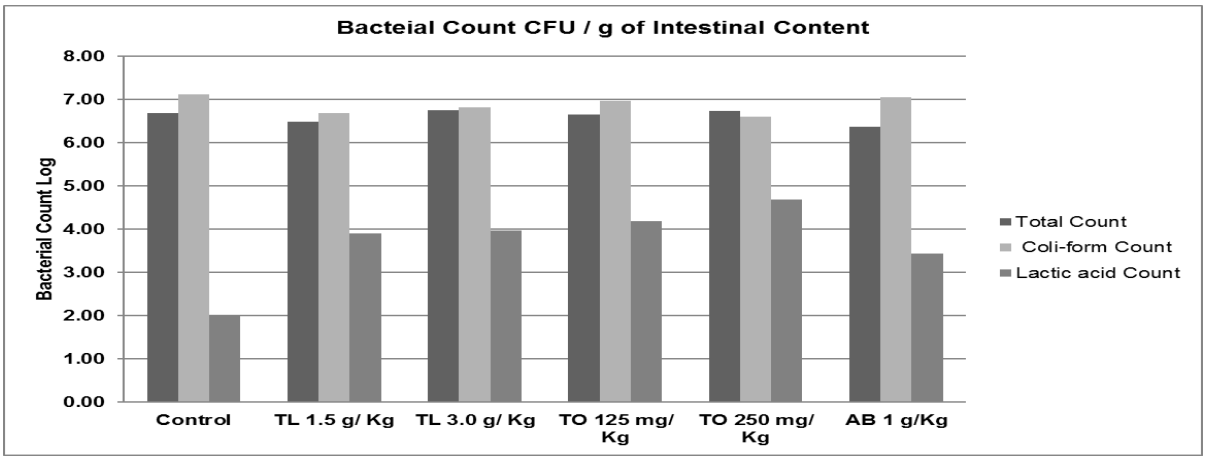


Fig.(1): The histological structure (at 40X) of the small intestine from broilers fed different biological additives and a control group.

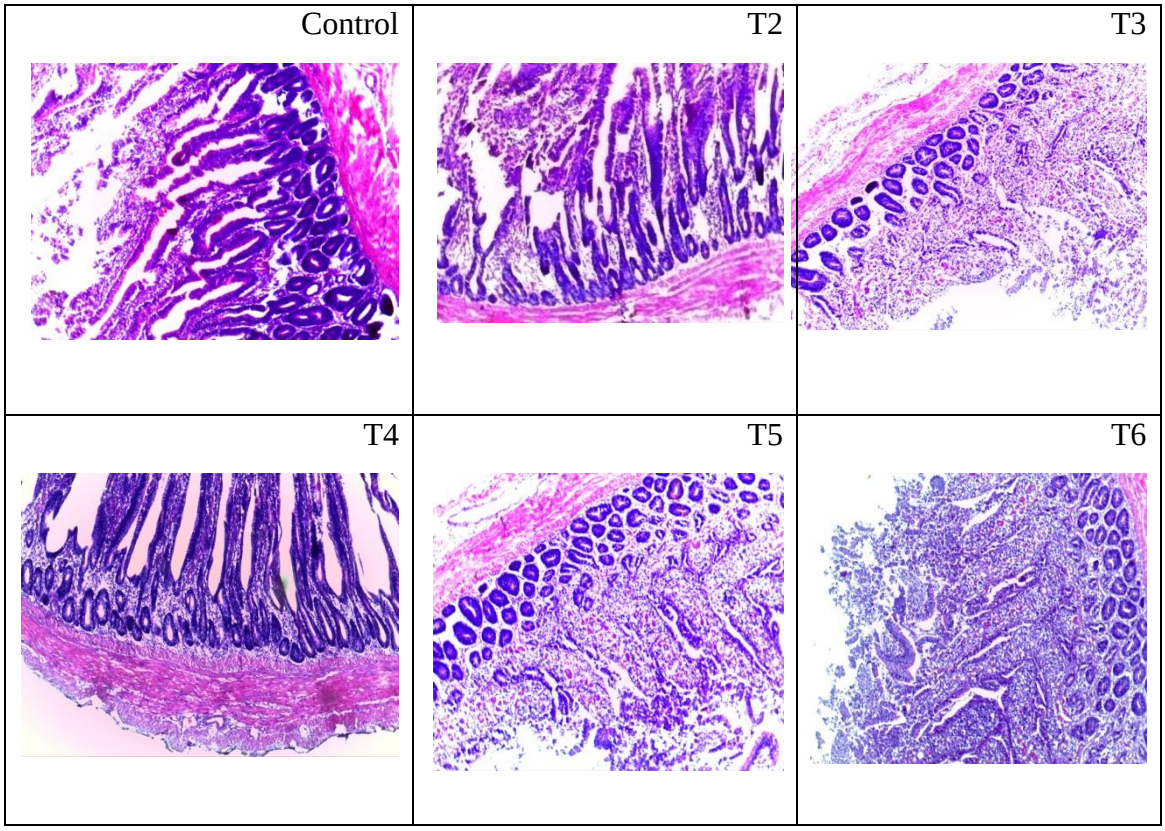
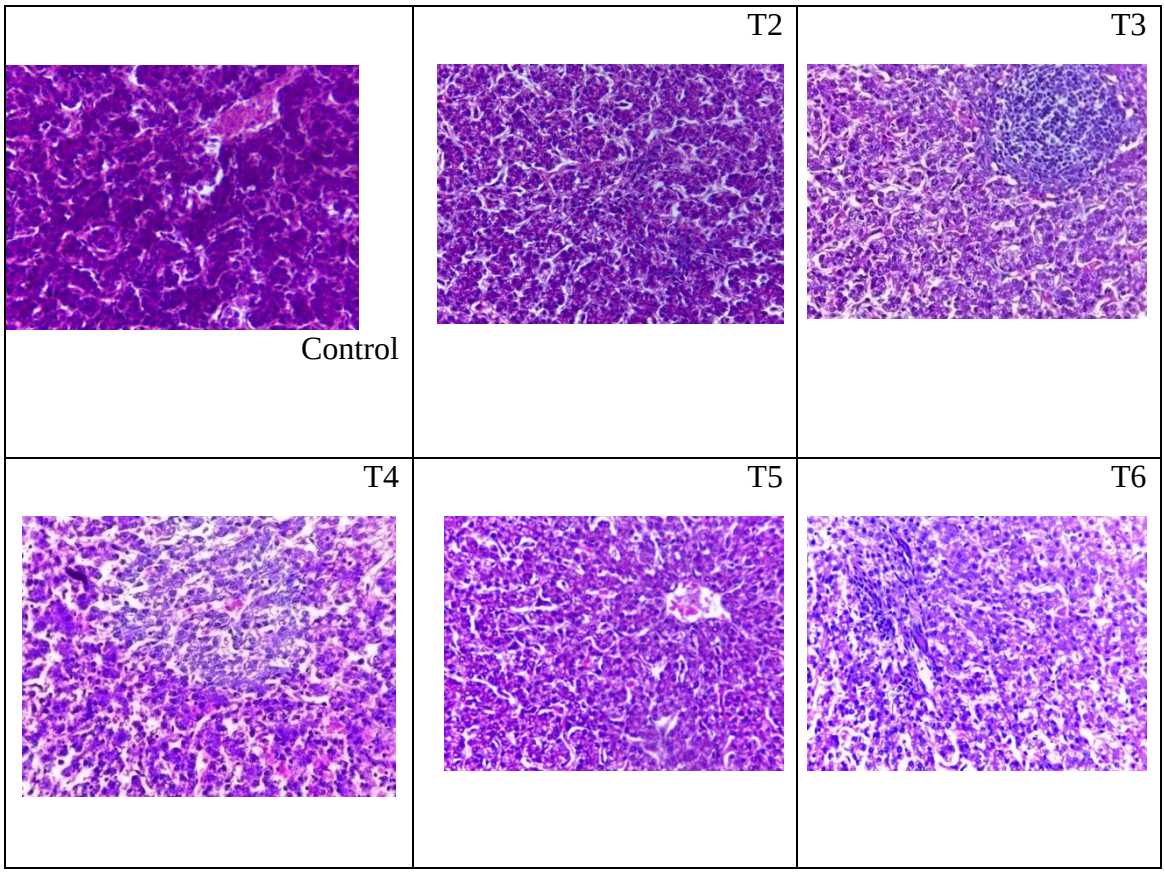


Fig. (2): The histological structure (at 40X) of the liver from broilers fed different biological additives and a control group.



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أوراق الزعتر أو الزيت المستخلص لتحسين الأداء الإنتاجى والحالة الفسيولوجية لبدارى التسمين

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أجريت تجربة لدراسة تأثير إضافة أوراق الزعتر TL، زيت الزعتر TO (بمستويين لكليهما)، مضاد حيوى لينكوميسين (منشط نمو) إلى علائق بدارى التسمين على الأداء الإنتاجى، صفات الذبيحة، بكتريا الأمعاء، بعض قياسات الدم والهستولوجي و الكفاءة الاقتصادية.

استخدم فى هذه الدراسة عدد (١٨٠) كتكوت عمر يوم لسلالة الهبرد وزعت عشوائياً على ٦ معاملات تجريبية تحتوى كل معاملة ٣٠ كتكوت مقسمة على ٣ مكررات والمعاملات كالآتى المجموعة الأولى تم تغذيتها على عليقة قاعدية بدون إضافات (كنترول T_1) فى حين المجموعات الخمسة الأخرى تغذت على عليقة قاعدية مضاف إليه ١,٥ جم TL /كجم (T_2) ، ٣,٠ جم TL/ كجم (T3) ، ١٢٥ ملليجرام TO/ كجم (T4)، ٢٥٠ ملليجرام TO / كجم (T5)، ١,٠ جم مضاد حيوى / كجم (T6). وكانت أهم النتائج المتحصل عليها ما يلى:

- أعطت الكتاكيت المغذاة على عليقة قاعدية مضاف إليها زيت الزعتر (T5) أو مضاد حيوى (T6) قياسات نمو معادلة لقياسات النمو للكتاكيت المغذاة على عليقة المقارنة (T1). ولكنها أعطت قيم أفضل معنوياً لمعامل التحويل الغذائى.
- صفات الذبيحة لم تختلف تبعاً للمعاملات الغذائية بينما تأثرت % للدهن و% للغدة الثيموثية.
- صفات الدم لم تتأثر بالمعاملات الغذائية المختلفة إلا أن إضافة زيت الزعتر (T_5) وورق الزعتر (T_3) أثر معنوياً على قيم الألبيومين وALT.
- سجلت الكتاكيت المغذاة على عليقة مضاف إليها زيت الزعتر (T5) أعلى قيم لنشاط الإنزيمات فى المعدة والأمعاء بالمقارنة مع باقى المعاملات وأعلى قيم لعدد البكتريا النافعة وأقل قيم لبكتريا القولون فى الأمعاء بالمقارنة بباقى المعاملات.
- التقييم الاقتصادى أوضح أن إضافة أوراق الزعتر أو زيت الزعتر بالمستويات المختلفة أو المضاد الحيوى إلى العليقة القاعدية خفض من العائد الاقتصادى بمعدلات تتراوح ما بين ٢-٢١% بالمقارنة بمجموعة الكنترول (T_1).

الكتاكيت المغذاة على عليقة مضاف إليها زيت زعتر (T_5) أعطت أداء إنتاجى مساوى لعليقة الكنترول وحسنت معامل تحويل الغذائى وحسنت بكتريا الأمعاء وإفراز الإنزيمات الهاضمة فى المعدة والأمعاء.