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# USING SOME MEDICINAL PLANTS IN BROILER CHICKS NUTRITION

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## ABSTRACT

This experiment was carried out to determine the effect of using Cymbopogon citratus leaves (CCL) and Eucalyptus globulus leaves (EGL) as feed additives on growth performance, slaughter test, digestibility coefficient, some plasma constituents, sensory evaluation (panel test) and economical efficiency. Two hundred and seventy Hubbard broilers fed on the basal diet at the first week then divided into nine groups at 1week (wk) of age. The first group was fed on the control diet, whereas groups 2, 3, 4 and 5 were fed on the control diet supplemented with CCL at levels 0.02/0.02, 0.02/0.04, 0.04/0.04 and 0.04/0.06% (grower/finisher), respectively. And groups 6, 7, 8, and 9 were fed on the control diets supplemented with EGL at levels of 0.02/0.02, 0.02/0.04, 0.04/0.04 and 0.04/0.06% (grower/finisher), respectively.

The obtained results showed that CCL or EGL addition to broiler diets significantly *(P<0.05)* improved live body weight (LBW) and body weight gain (BWG). Using different levels of CCL or EGL had no significant differences in feed consumption. Feed conversion (FC) was significantly improved with CCL and EGL as feed additives. Also there was no effect on mortality due to experimental treatments.

Addition of CCL or EGL significantly improved digestibility coefficients *(P<0.05)* of DM, OM, CP, and NFE. There were no effects on digestibility coefficient of EE and CF due to the dietary treatments.

Carcass and total edible parts (%) were significantly *(P<0.05)* increased with increasing CCL levels in the broiler diets, while there were no significant differences due to the addition of EGL in the diets. The addition of CCL or EGL showed significant effect on spleen, bursa and thymus gland.

Broiler chicks fed on diets supplemented with medicinal plants showed lower values of plasma abdominal fat, cholesterol content and total lipids. No significant differences were observed in plasma total protein, albumin, globulin and A/G ratio, while there was significant effect *(P<0.05)* on GOT and GPT but with no deleterious effects on liver function.

Addition of CCL or EGL improved sensory properties (color, taste, aroma and consistency) and relative economic efficiency (REE).

In general, the obtained results indicated that using CCL and EGL enhance the growth performance and economical efficiency with no deleterious effects on plasma constituents of broiler chicks.

## INTRODUCTION

Medicinal plants have been used for many years in human nutrition as spices and medical additives. In recent years, these plant species have been used as a feed additive instead of the chemical compounds. Feed additives are the most important material can improve poultry growth and performance. However, using the chemical compounds as feed additives may cause unfavorable effects. On the other hand, some medicinal plants such as (CCL

or EGL) can be used as feed additives without any unfavorable effect on broiler chicks.

*Eucalyptus globulus* and *Cymbopogon citratus* have been used in medicine pharmaceutical, as a flavor, perfumery, comestic and several other uses. *Cymbopogon citratus* leaves used to treat the gastro intestinal complaints, nervous disturbance, feverish conditions and as diuretic, anti-emetic and antirheumatic. It also shows unique antispasmodic properties, (El-Amary, 1993). While EG leaves had some properties as antiseptic (Mahran, 1967), and as antispasmodic (El-Amary, 1993).

*Cymbopogon citratus* has an antibacterial activity (Onawunmi, *et al.*, 1984, Onawunmi and Ogunlana, 1986 and Deans, *et al.*, 1992) and antifungal properties (Deans, *et al.*, 1992, Duby *et al.*, 2000 and Dharmendra, *et al.*, 2001). Also EE has an antibacterial activities (Medici, *et al.*, 1992 and Hmamouchi, *et al.*, 1992).

The highest of growth rat of sheep fed diet supplemented with CCL was observed compared to those fed on control diet (Vuuren, *et al.*, 1983), and the holestein-friesian heifers (Rosete, *et al.*, 1987). Feed consumption and body weight were improved with the diets treated with different concentration of the CCL essential oil in rats (Mishra, *et al.*, 1992), and in rabbit (Soliman, *et al.*, 1995). Swanston, *et al.*, (1990) discovered that body weight gain and feed consumption of mice were not altered by 12 days of treatment with EGL.

Aboul-Fotouh, *et al.*, (1999) found that the daily gain improved when the lambs fed diet contains 5% CC + 3% EG. They also found that the OM, CP, CF and NFE were significantly improved by adding 5% CCL + 3% EGL. Also, Fritz, *et al.*, (1992 and 1993) found that medicinal plants had beneficial effects on live weight gain and feed efficiency with broiler chicken.

Blood protein, cholesterol and urea levels, and the activities of GOT and GPT did not significantly different between the rats fed on diet treated with different levels of essential oil of CC (Mishra, *et al.*, 1992). On the other hand, Orisakwe, *et* al., (1998) reported that the CC produced no significant *($P<0.05$)* changes in plasma liver function index. Also Swanston, *et al.*, (1990) reported that plasma glucose and insulin concentrations in normal mice were not altered by 12 days of treatment with EG.

The objective of this study was to evaluate the effect of using some dried medicinal plants (Cymbopogon citratus and Eucalyptus globulus leaves) as feed additives on chicken performance, carcass traits, blood constituents, nutrient digestibility coefficients, panel test and the economical evaluation of the tested diet.

## MATERIALS AND METHODS

This study was carried out at El-Kanater El-Khayria, Poultry Station, Kalubia Governorate, and Poultry Nutrition Section, Animal Production Research Institute, Ministry of Agriculture.

**Preparing of supplements:**

Dried Cymbopogon citratus and Eucalyptus globulus leaves were obtained from the unit of medicinal plants in El-Kanater El-Khayria, which is belong to Horticultural Crops Research Institute, and grounded, then used as

a feed supplemented. The chemical composition for CCL and EGL are presented in Table (1).

**Table (1). The chemical composition of CC and EG leaves.**

| Material | DM | Chemical composition % on DM basis | | | | | |
|---|---|---|---|---|---|---|---|
| | % | OM | CP | EE | CF | NFE | Ash |
| Cymbopogon citratus (CC) | 92.10 | 93.06 | 5.76 | 2.39 | 22.72 | 62.19 | 6.94 |
| Eucalyptus globulus (EG) | 92.10 | 92.73 | 6.48 | 2.35 | 20.69 | 63.21 | 7.27 |

OM Organic matter CP Crude protein EE Ether extract
CF Crude fiber NEF Nitrogen free extract.

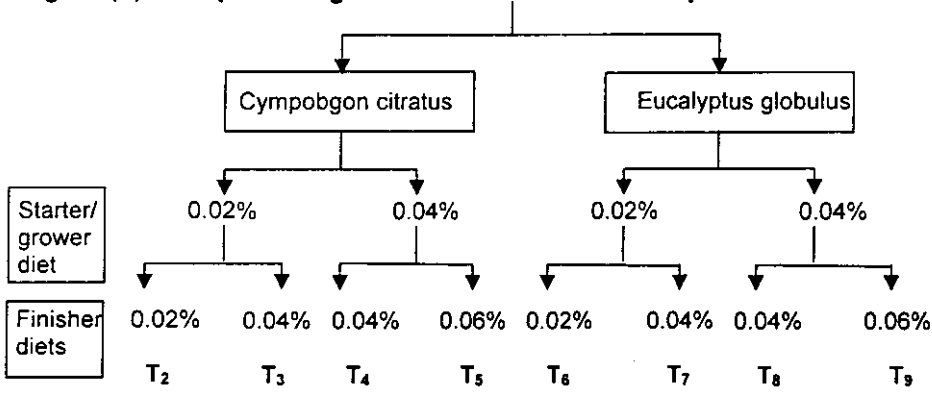
**Experimental Birds:**

Unsexed 270 one-day old Hubbard broiler chicks were used in this experimental study. Birds were wings banded, individually weighted to the nearest gram, and randomly divided into nine groups, with three replicates of ten chicks each and having nearly similar body weight. All chicks were vaccinated against Newcastle disease, at seven and twenty two days of age with Hitchner B1, Lasota strain vaccine and Gumbora vaccine against Bursal disease. And birds were reared under similar management condition.

**Experimental Diets:**

A corn-soybean basal diet that met all the requirements recommended by Agriculture Ministry Decree (1996) was fed to birds in the control and treatments groups at the first week. The grower diets fed from 7 to 28 days and the finisher diets from 29 to 42 days of age were presented in Table (2). All diets were formulated using linear programming to be isonitrogenous (about 21% CP) and isocaloric (about 2949 kcal ME/kg diet) from 1-3 wk. of age for starter/grower period. And about 17.5 % CP and about 3006 kcal ME/kg diet from 4-6 wk. of age for the finisher period. Mineral, methionine, lysine and vitamin mixtures were added to cover the requirements according to the Agriculture Ministry Decree.

**Figure (1): The percentage of feed additives in the experimental diets.**



The experimental diets were divided into control group and 8 treatment groups in which medicinal plants (CCL and EGL) were supplemented. The basal diet, without herbs supplement was considered as a control diet. While the percentages of herbs supplemented (0.02/0.02, 0.02/0.04, 0.04/0.04 and 0:04/0 06%(grower/finisher)) are shown in Figure (1).

Chickens consumed the diets and water *ad libitum*. Artificial lightening was provided 24 hours daily all over the experimental period.

**Table (2): A corn-soybean basal diet composition.**

| Item | Starter/grower Diet % ( 7 to 28 day ) | Finisher Diet % ( 28 to 42 day ) |
|---|---|---|
| **Ingredients** | | |
| Yellow Corn | 56.15 | 67.30 |
| Soybean meal(44%) | 37.80 | 28.00 |
| Soy oil (crude) | 2.65 | 1.50 |
| Di Calcium phosphate | 1.65 | 1.75 |
| Limestone | 1.05 | 0.80 |
| Salt | 0.30 | 0.30 |
| Premix * | 0.30 | 0.30 |
| DL-Methionine | 0.10 | 0.05 |
| Total | 100 | 100 |
| **Chemical analysis (as fed basis):** | | |
| **A- Determind analysis (%):** | | |
| Dry matter | 89.15 | 89.11 |
| Organic matter | 79.53 | 78.47 |
| Crude protein | 21.10 | 17.52 |
| Ether extract | 5.35 | 4.56 |
| Crude fiber | 4.10 | 3.52 |
| Nitrogen free extract | 48.98 | 52.87 |
| **B- Calculated analysis(%):** | | |
| ME kcal/kg | 2949.415 | 3006.322 |
| Lysine | 1.249 | 0.813 |
| Methionine | 0.455 | 0.365 |
| Methionine + Cyctine | 0.800 | 0.659 |
| Sodium | 0.131 | 0.133 |
| Calcium | 0.908 | 0.671 |
| Total Phosphorous | 0.687 | 0.457 |
| Available Phosphorous | 0.455 | 0.987 |

*** The vitamin mineral premix added to 1kg of the experimental diets contain: Vitamin A: 10.000 IU; Vitamin $D_3$: 2.000 IU; Vitamin E: 10 mg; Vitamin K: 2 mg; Vitamin $B_1$: 1 mg; Vitamin $B_2$: 5 mg; Vitamin $B_6$: 1.5 mg; Vitamin $B_{12}$: 10 mg; Pantothenic: 10 mg; Niacin: 30 mg; Folic acid: 1 mg; Biotin: 50 mg; Choline chloride: 250 mg; Iron: 30 mg; Manganese: 60 mg; Copper: 4 mg; Iodine: 0.3 mg; Cobalt: 0.1 mg; Zinc: 50 mg and Selenium: 0.1 mg.**

**Growth Performance:**

Live body weights (LBW) and feed consumption were recorded weekly. Body weight gain (BWG) and feed conversion (FC) were calculated. Also dead birds were recorded of the tested diets at the end of the experiment.

**Digestibility trials:**

At the end of the experimental period, nine digestibility trials were carried out to estimate the digestibility coefficients of the experimental diets. Three Hubbard broiler chicks were used in each digestibility trials (27chicks for all the experimental digestibility trials).The chicks were individually housed in digestible cages, and they were weighted at the start and the end of the experiment. The feces were collected for 3 days per each treatment. Samples of feces were collected and sprayed with 10% formaldehyde and then dried overnight at 60-70°C, weighted, ground and then completely dried at 105°C for 3hrs. and weighted. The sample of diets and feces for each treatment were collected together, grounded and stored for chemical analysis.

**Chemical analysis:**

The chemical composition of the dietary treatment, CC, EGL and feces were analyzed according to methods of A.O.A.C. (1990).

**Slaughter tests:**

At the end of the experiments (6wk), three chicks of each treatment were randomly assigned to slaughter test. The chicks were fasted for 12hrs before slaughtering. Carcasses were manually eviscerated. Liver, heart, gizzard and abdominal fat were removed and weighed and calculated as a percentage of LBW. Spleen, Thymus gland and Bursa gland were removed and weighed as lymphatic organs.

**Blood Constitutes:**

At the time of slaughter blood samples were drawn from the scarified birds of each treatment in heparinized glass tubes (5ml), centrifuged at 3000 r.p.m. for 15 minutes and plasma was stored frozen at -20°C until performing of the biochemical analysis. The collected blood samples were assigned to determination of total protein as described by Gornall, *et al.*, (1949), Albumin according to method of Doumas, *et al.*, (1971), Cholesterol according to the methods of Ratlliff and Hall, (1973), Total lipid was measured according to Zollner and Kirsch, (1962) and GOT and GPT according to Reitman and Frankel, (1957).

**Sensory evaluation (panel test):**

The panel tests evaluate color, flavor and consistency. The panel test was consisting of 10 judges. The more acceptable was the higher value. Meat samples obtained from different parts of carcass were cooked by the boiling method taken the same time, cut into 2 $cm^2$ and estimated according to Tilgner, (1957).

**Economic evaluation:**

The economic evaluation of the end product based on the difference between weight gain and feeding cost. Economic evaluations were calculated as the net revenue per unit of total cost (Habib, 2004).

**Statistical analysis:**

Statistical analysis of the obtained results were carried out using GLM procedure of the SAS program (SAS, 1999). And the differences between

treatment means were separated using Duncan's (1995) new multiple range test at a probability level of 0.05.

## RESSULTS AND DISCUTION

**Growth Performance:**

The effects of using different levels of CCL or EGL on growth performance are shown in Tables (3) and (4). Final LBW were significantly improved ($p<0.05$) with increasing the levels of CCL in the diet. However, $T_5$ showed the best results of LBW. This result is in agreement with that of Mishra, *et al.*, (1992). Also there were significant differences in final LBW in EGL supplemented diets. The best LBW was 1882.03 for $T_8$, while the control group ($T_1$) was 1721.7gm. The result may be regard to EGL have some properties as antiseptic, antispasmodic, antibacterial activities against harmful microorganism, treatment of gastro-intestinal complaints and tonic (Toyzyo, *et al.*, 1994).

Also BWG significantly improved. The highest BWG was for the chicks fed on diets supplemented with 0.04/0.06% CCL. While, the chicks fed on control diet resulted in the lowest BWG. This result was agreed with Singh and Taparia, (1992). Also Vuuren, *et al.*, (1983) found that average daily gain for the sheep fed on CCL herbage were highly significant than other treatments. Also the final LWG was significantly different between EGL treatment diets. This result indicates that the different levels of EG herbage-supplemented diet have significantly effect on BWG.

**Table (3): The effect of using CC as a feed additive on broilers growth performance.**

| Item | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | SI |
|---|---|---|---|---|---|---|
| **Live Body Weight (g):** | | | | | | |
| 1 wk | 150.33±0.55 | 150.53±0.38 | 150.5±0.29 | 149.97±0.03 | 150.03 ± 0.1 | NS |
| 3 wk | 719±12.86 | 721.03 ±8.73 | 738.27±2.43 | 741.67±7.31 | 744.83 ± 8.8 | NS |
| 6 wk | $1721.7^{d}$±16.5 | 1807.07c±10 | $1825^{bc}$±16.6 | $1857.67^{ab}$±1 | $1875.37^{a}$±11 | ** |
| **Live Weight Gain (g):** | | | | | | |
| 1-3wk | 568.67±13.4 | 570.5±8.36 | 587.77±2.71 | 591.7±7.34 | 594.8±8.85 | NS |
| 4-6wk | $1002.7^{b}$±29.3 | $1086.03^{a}$±15 | $1086.77^{a}$±14 | $1116^{a}$±18.96 | $1130.53^{a}$±7.4 | ** |
| 1-6wk | $1571.37^{d}$±16 | $1656.53^{c}$±9.9 | $1674.5^{bc}$±17 | $1707.7^{ab}$±13 | $1725.33^{a}$±10 | ** |
| **Feed Consumption (g/bird):** | | | | | | |
| 1-3wk | 853.17±1.07 | 874.13±28.7 | 879.07± 8.32 | 894.1±5.82 | 900.1±14.47 | NS |
| 4-6wk | 2581.87±53 | 2472.43±13 | 2431.77±41 | 2425±56.74 | 2484.07±36 | NS |
| 1-6wk | 3435.1±52.8 | 3346.57±37 | 3310.83±41 | 3318.77±59 | 3384.17±50 | NS |
| **Feed Conversion (feed/gain):** | | | | | | |
| 1-3wk | 1.50±0.036 | 1.53±0.031 | 1.50±0.009 | 1.51±0.012 | 1.51 ± 0.021 | NS |
| 4-6wk | $2.58^{a}$±0.058 | $2.28^{b}$±0.044 | $2.24^{b}$±0.018 | $2.17^{b}$ ±0.051 | $2.20^{b}$ ± 0.028 | ** |
| 1-6wk | $2.19^{a}$±0.025 | $2.02^{b}$±0.030 | $1.98^{b}$±0.007 | $1.94^{b}$±0.032 | $1.96^{b}$ ± 0.017 | ** |
| **Number of dead birds** | | | | | | |
| | 1 | 1 | 0 | 1 | 1 | |

**a,b,c,d = Means on the same row under the same treatment differently superscripted are significantly different ( P<0.05). SI = Significance. NS = non-significant.**
**$T_1$ control treatment $T_2$ 0.02 / 0.02% CC $T_3$ 0.02 / 0.04 % CC**
**$T_4$ 0.04 / 0.04 % CC $T_5$ 0.04 / 0.06 % CC.**

Table (4): The effect of using EG as a feed additive on broilers growth performance.

| Item | $T_1$ | $T_6$ | $T_7$ | $T_8$ | $T_9$ | SI |
|---|---|---|---|---|---|---|
| **Live Body Weight (g):** | | | | | | |
| 1 wk | 150.33±0.55 | 149.87±0.2 | 150.3±0.35 | 150.53± 0.37 | 150.67±1.2 | NS |
| 3 wk | 719±12.86 | 725±10.73 | 732.53±11.5 | 745.87± 3.91 | 717.7±1.86 | NS |
| 6 wk | 1721.7$^{d}$±16.5 | 1854.2$^{a}$±17.6 | 1844.97$^{a}$±16 | 1882.03$^{a}$±8.2 | 1853.6$^{a}$±8.23 | ** |
| **Live Weight Gain (g):** | | | | | | |
| 1-3wk | 568.67±13.4 | 575.13±10.9 | 582.3±11.18 | 595.33±4.02 | 567.03±1.79 | NS |
| 4-6wk | 1002.7$^{b}$±29.3 | 1129.2$^{a}$±18.6 | 1112.37$^{a}$±18. | 1136.17$^{a}$±11 | 1135.9$^{a}$±9.9 | ** |
| 1-6wk | 1571.37$^{d}$±16 | 1704.3$^{a}$±17.8 | 1694.67$^{a}$±16 | 1731.5$^{a}$±8.33 | 1702.93$^{a}$±9.2 | ** |
| **Feed Consumption (g/bird):** | | | | | | |
| 1-3wk | 853.17±1.07 | 891.37$^{a}$± 2.92 | 875.17$^{ab}$±11 | 882.4$^{ab}$±16.4 | 881.47$^{ab}$±6.4 | NS |
| 4-6wk | 2581.87±53 | 2438.27$^{b}$±29 | 2435.1$^{b}$±2.53 | 2457.83$^{b}$±45 | 2550.6$^{ab}$±22 | * |
| 1-6wk | 3435.1±52.8 | 3329.63±27 | 3310.27±13 | 3340.2±48.7 | 3432 ±26.5 | NS |
| **Feed Conversion (feed/gain):** | | | | | | |
| 1-3wk | 1.50±0.036 | 1.55 ± 0.025 | 1.51 ± 0.018 | 1.48 ± 0.017 | 1.56 ± 0.014 | NS |
| 4-6wk | 2.58$^{a}$±0.058 | 2.16$^{b}$ ± 0.018 | 2.19$^{b}$ ± 0.033 | 2.16$^{b}$ ± 0.055 | 2.25$^{b}$ ± 0.031 | ** |
| 1-6wk | 2.19$^{a}$±0.025 | 1.95$^{bc}$±0.020 | 1.95$^{bc}$± 0.01 | 1.93$^{c}$ ± 0.035 | 2.02$^{b}$ ± 0.023 | ** |
| **Number of dead birds** | | | | | | |
| | 1 | 1 | 1 | 1 | 1 | |

a,b,c,d = Means on the same row under the same treatment differently superscripted are significantly different ( P<0.05). SI = Significance. NS = non-significant.
$T_1$ control treatment $T_2$ 0.02 / 0.02% EG $T_3$ 0.02 / 0.04 % EG
$T_4$ 0.04 / 0.04 % EG $T_5$ 0.04 / 0.06 % EG.

Using different levels of CCL or EGL have no significant difference in feed consumption. These results are in agreement with those of Tartratoon, *et al.*, (2002) who reported that there were no significant differences in feed consumption of pigs between experimental treatments. While Mishra, *et al.*, (1992) found that feed consumption of rats were increased with the diets treated with different concentrations of CCL.

Feed conversion was significantly improved with CCL supplemented diets. Also using EGL as a feed additive in different levels improved FC. The obtained results are in agreement with those of Soliman, *et al.*, (1995), who found that FC ratio improved when using some medicinal plants as a natural feed additives in rabbits diets. Also, Aboul-Fotouh, *et al.*, (2000) showed that FC ratio improved in buffaloes with using medicinal plants supplementation.

There were no moralities due to any of the experimental treatment. The total mortality averaged between 5 – 6 % and not due to experimental treatments but may be due to the natural causes.

**Digestibility trials:**

The effects of using CCL or EGL as feed additives on digestibility coefficients of DM, OM, CP, EE, CF and NFE are presented in Tables (5) and (6). The digestibility coefficients of DM, OM, CP, and NFE were significantly improved with adding CCL or EGL to the diets.

Neither added CCL nor EGL to the experimental diets had effect on CF and EE digestibility coefficients. This may be due to the high content of crude fiber in CCL and EGL (i.e. 22.72 & 20.69%, respectively).

These results agreed with Aboul-Fotouh, *et al.*, (1999) who found that OM, CP and NFE digestibilities were significantly improved by adding 5% CC + 3% EG.

**Table (5): The effect of using CC as feed additives on Digestibility coefficients.**

| Item | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | SI |
|---|---|---|---|---|---|---|
| Nutrients digestibility coefficients (%) | | | | | | |
| DM | $65.25^{b}\pm0.16$ | $65.73^{a}\pm0.12$ | $65.83^{a}\pm0.09$ | $66.02^{a}\pm0.08$ | $66.08^{a}\pm0.09$ | ** |
| OM | $68.71\pm0.11^{c}$ | $68.79^{bc}\pm0.11$ | $68.98^{abc}\pm0.1$ | $69.04^{ab}\pm0.04$ | $69.14^{a}\pm0.04$ | * |
| CP | $85.66\pm0.11^{c}$ | $85.80^{bc}\pm0.11$ | $85.47^{bc}\pm0.03$ | $85.96^{ab}\pm0.04$ | $86.12^{a}\pm0.07$ | * |
| EE | 82.58±0.06 | 82.76±0.11 | 82.77±0.12 | 82.87±0.07 | 83.03±0.09 | NS |
| CF | 30.57±0.08 | 30.42±0.21 | 30.38±0.16 | 30.66±0.11 | 30.65±0.15 | NS |
| NFE | $78.23^{c}\pm0.06$ | $78.41^{bc}\pm0.07$ | $78.61^{ab}\pm0.04$ | $78.67^{a}\pm0.11$ | $78.81^{a}\pm0.07$ | ** |

a,b,c,d = Means on the same row under the same treatment differently superscripted are significantly different ( P<0.05). SI = Significance. NS = non-significant
$T_1$ control treatment $T_2$ 0.02 / 0.02% CC $T_3$ 0.02 / 0.04 % CC
$T_4$ 0.04 / 0.04 % CC $T_5$ 0.04 / 0.06 % CC.

**Table (6): The effect of using EG as feed additives on Digestibility coefficients.**

| Item | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | SI |
|---|---|---|---|---|---|---|
| Nutrients digestibility coefficients (%) | | | | | | |
| DM | $65.25^{b}\pm0.16$ | $65.77^{a}\pm0.09$ | $65.85^{a}\pm0.05$ | $66.09^{a}\pm0.05$ | $65.76^{a}\pm0.10$ | ** |
| OM | $68.71^{c}\pm0.11$ | $68.75^{bc}\pm0.1$ | $69.04^{a}\pm0.05$ | $69.07^{a}\pm0.04$ | $68.96^{ab}\pm0.04$ | * |
| CP | 85.66±0.11 | 85.80±0.08 | 85.91±0.02 | 86.03±0.04 | 85.91±0.09 | NS |
| EE | 82.58±0.06 | 82.78±0.10 | 82.80±0.12 | 82.88±0.05 | 82.95±0.05 | NS |
| CF | 30.57±0.08 | 30.41±0.20 | 30.38±0.18 | 30.65±0.12 | 30.44±0.04 | NS |
| NFE | $78.23^{b}\pm0.06$ | $78.43^{ab}\pm0.03$ | $78.62^{a}\pm0.04$ | $78.67^{a}\pm0.11$ | $78.61^{a}\pm0.15$ | ** |

a,b,c,d = Means on the same row under the same treatment differently superscripted are significantly different ( P<0.05). SI = Significance. NS = non-significant
$T_1$ control treatment $T_2$ 0.02 / 0.02% EG $T_3$ 0.02 / 0.04 % EG
$T_4$ 0.04 / 0.04 % EG $T_5$ 0.04 / 0.06 % EG.

**Carcass Characteristics:**

The effect of using medicinal plants (CCL or EGL) as feed additives in the carcass characteristics are presented in Tables (7) and (8).

The results showed that percentages of carcass were significantly increased by increasing CCL levels. While there were no significant differences in the carcass due to use different levels of EGL as feed additives. The carcass values were higher in the treatments $T_3$, $T_4$ and $T_5$ (74.51, 75.59 and 76.89%, respectively). Then those of $T_1$ (control) and $T_2$. The carcass percentage values of $T_6$, $T_7$, $T_8$, and $T_9$ were 75.68, 75.67, 72.52 and 70.63%, respectively, without significant differences among them.

The percentages of the heart indicated no significant differences due to CCL treatments. On the contrary, EGL treatments were significantly affected heart percentages. The group of $T_9$ showed the higher percentage of heart

1.29%. While the heart percentages were nearly similar in $T_1$, $T_6$, $T_7$ and $T_8$ being 0.46, 0.43, 0.50 and 0.51%, respectively.

**Table (7): The effect of using CC as feed additives in broilers diets on some carcass traits.**

| Treatment | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | SI |
|---|---|---|---|---|---|---|
| Carcass % | 71.08$^{c}$±0.59 | 72.34$^{bc}$±1.4 | 74.51$^{ab}$±0.4 | 75.59$^{a}$±0.5 | 76.89$^{a}$±0.3 | ** |
| Giblets % | 5.69±0.10 | 5.80±0.07 | 5.80±0.06 | 5.66±0.03 | 5.66±0.10 | NS |
| Heart % | 0.46±0.02 | 0.46±0.01 | 0.45±0.01 | 0.45±0.01 | 0.46±0.01 | NS |
| Liver % | 2.83±0.06 | 2.84±0.03 | 2.84±0.05 | 3.20±0.36 | 2.96±0.04 | NS |
| Gizzard % | 2.39$^{ab}$±0.04 | 2.49$^{a}$±0.04 | 2.51$^{a}$±0.05 | 2.35$^{ab}$±0.04 | 2.24$^{b}$±0.07 | * |
| Total Edible Parts % | 76.76$^{c}$±0.66 | 78.13$^{bc}$±1.4 | 80.32$^{ab}$±0.4 | 81.58$^{a}$±0.1 | 82.55$^{a}$±0.3 | ** |
| Non Edible Parts % | 23.24$^{a}$±0.7 | 21.87$^{ab}$±1.4 | 19.68$^{bc}$±0.4 | 18.42$^{c}$±0.14 | 17.45$^{c}$±0.28 | ** |
| Abdominal Fat % | 1.47$^{a}$±0.06 | 1.32$^{ab}$±0.03 | 1.25$^{bc}$±0.03 | 1.09$^{c}$±0.11 | 1.05$^{c}$±0.05 | ** |
| Spleen % | 0.17$^{b}$±0.01 | 0.17$^{b}$±0.003 | 0.17$^{b}$±0.01 | 0.21$^{a}$±0.01 | 0.17$^{b}$±0.01 | * |
| Bursa % | 0.08$^{c}$±0.01 | 0.11$^{b}$±0.01 | 0.12$^{ab}$±0.01 | 0.14$^{a}$±0.01 | 0.13$^{a}$±0.003 | ** |
| Thymus % | 0.32$^{c}$±0.02 | 0.36$^{b}$±0.01 | 0.36$^{b}$±0.02 | 0.40$^{b}$±0.01 | 1.02$^{a}$±0.32 | * |

a,b,c,d = Means on the same row under the same treatment differently superscripted are significantly different ( P<0.05 ). % = Average of percentages relative to LBW.
SI = Significance. NS = non-significant.
$T_1$ control treatment $T_2$ 0.02 / 0.02% CC $T_3$ 0.02 / 0.04 % CC
$T_4$ 0.04 / 0.04 % CC $T_5$ 0.04 / 0.06 % CC.

**Table (8): The effect of using EG as feed additives in broilers diets on some carcass traits.**

| Treatment | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | SI |
|---|---|---|---|---|---|---|
| Carcass % | 71.08 ±0.59 | 75.68±2.85 | 75.67±0.88 | 72.52±1.29 | 70.63±2.58 | NS |
| Giblets % | 5.69$^{b}$±0.10 | 5.58$^{b}$±0.02 | 5.78$^{b}$±0.01 | 6.23$^{ab}$±0.41 | 6.94$^{a}$±0.36 | ** |
| Heart % | 0.46$^{b}$±0.02 | 0.43$^{b}$±0.02 | 0.50$^{b}$±0.02 | 0.51$^{b}$±0.02 | 1.29$^{a}$±0.35 | * |
| Liver % | 2.83±0.06 | 2.87±0.02 | 2.90±0.04 | 3.19±0.36 | 3±0.02 | NS |
| Gizzard % | 2.39$^{c}$±0.04 | 2.29$^{c}$±0.02 | 2.36$^{c}$±0.05 | 2.52$^{b}$±0.04 | 2.64$^{a}$±0.02 | ** |
| Total Edible Parts % | 76.76$^{c}$±0.66 | 81.26±2.84 | 81.44±0.89 | 78.87±1.74 | 77.57±2.22 | NS |
| Non Edible Parts % | 23.24$^{a}$±0.66 | 18.74±2.84 | 18.56±0.89 | 21.13±1.74 | 22.43±2.22 | NS |
| Abdominal Fat % | 1.47$^{a}$±0.06 | 1.34$^{ab}$±0.02 | 1.24$^{ab}$±0.03 | 1.21$^{ab}$±0.05 | 0.81$^{b}$±0.35 | * |
| Spleen % | 0.17$^{b}$±0.01 | 0.21$^{cd}$±0.02 | 0.24$^{bc}$±0.01 | 0.29$^{b}$±0.01 | 0.43$^{a}$±0.03 | ** |
| Bursa % | 0.08$^{c}$±0.01 | 0.1$^{ab}$±0.003 | 0.12$^{a}$±0.01 | 0.12$^{a}$±0.01 | 0.12$^{a}$±0.01 | * |
| Thymus % | 0.32$^{b}$±0.02 | 0.32$^{b}$±0.01 | 0.32$^{b}$±0.03 | 0.34$^{b}$ ± 0.02 | 1.01$^{a}$ ± 0.34 | * |

a,b,c,d = Means on the same row under the same treatment differently superscripted are significantly different ( P<0.05 ). % = Average of percentages relative to LBW.
SI = Significance. NS = non-significant.
$T_1$ control treatment $T_2$ 0.02 / 0.02% EG $T_3$ 0.02 / 0.04 % EG
$T_4$ 0.04 / 0.04 % EG $T_5$ 0.04 / 0.06 % EG.

The liver percentages indicated no significant differences due to CCL or EGL treatments. There were significant differences between the gizzard percentage of LBW due to using different levels of CCL or EGL as feed additives.

Giblets percentages relative to LBW were significantly affected by CCL. Giblets percentages of $T_1$, $T_2$, $T_3$, $T_4$ and $T_5$ were 5.59, 5.8, 5.8, 5.66 and 5.66%, respectively. The results indicated that the percentage of giblet of LBW was improved with increasing the percentage of EGL in diet. The best percentage was found with $T_9$ (0.04/0.06% EGL) being 6.62%, while $T_1$, $T_6$, $T_7$ and $T_8$ recorded the values of 5.69, 5.58, 5.78 and 6.23%, respectively.

The total edible parts and the non-edible parts of the slaughter birds were significantly affected by using CCL supplementation as a feed additive. The better total edible part percentage of LBW were obtain with the group of $T_3$, $T_4$, and $T_5$, being 80.32, 81.58 and 82.55%, respectively. Also, the non-edible parts were decreased in these treatments being 19.68, 18.42 and 17.45%, respectively. While $T_1$ and $T_2$ recorded the least total edible parts (76.76 and 78.13%, respectively). The total edible parts and the non-edible parts percentages were not affected by using EGL as a feed additive.

The results of abdominal fat relative to LBW revealed significant decrease with increasing the levels of CCL or EGL in diets. The abdominal fat percentage was 1.05% in $T_5$, while $T_2$, $T_3$ and $T_4$ resulted in 1.32, 1.25 and 1.09%, respectively. The control group showed the highest value of abdominal fat percentage (1.47%). Also $T_9$ showed the least percentage of abdominal fat (0.81%) compared with those of $T_1$, $T_6$, $T_7$ and $T_8$.

The results indicated that there were significant effect of using CCL or EGL as a feed additive on the percentages of spleen, Bursa and Thymus relative to LBW.

Abdel-Azeem, (2002) showed that, carcass traits and internal organs were not affected by dietary herbal feed additives with exception of that percentage of bursa which tended to be significant higher in broiler chicks fed on the unsupplemented control diet when compared to those fed the Digeston (herbal mixture). El-Gendi, *et al.*, (2000) found that dietary supplementation of herbal mixture (Bio-tonic) significantly increased total edible parts when compared with control group.

Tolba, (2003) reported that, no significant effects on relative weight of liver, spleen, bursa of fabricus and thymus gland for chicks fed on diets supplemented with fennel or thyme.

**Blood Constituents:**

Plasma total lipids, cholesterol, total protein, albumin, globulin, A/G ratio, GOT and GPT of birds as affected by medicinal supplementation are presented in Tables (9) and (10).

Total lipids in bird's plasma significantly decreased with increasing CCL in diet. On the other hand, using EGL as a feed additive did not affect total lipids. Also plasma cholesterol slightly decreased with CCL added, but the differences were not significant. While, Plasma cholesterol levels were significantly reduced with increasing EGL in the diet. There were no significant effect due to use CCL or EGL as feed additives on total protein, albumin, globulin and A/G ratio. The values of GOT and GPT were significantly increased by using CCL or EGL in broilers diets.

Mishra, *et al.*, (1992) found that blood protein, cholesterol and liver enzyme activities (GOT and GPT) did not differed in rats fed on control diet than those fed on diet treated with different levels of essential oil of CCL.

Our results were on similar trend with El-Gendi, *et al.*, (2000) and Abdel-Azeem, (2002) who indicated that, feeding chicks on the diet supplemented with Bio-tonic or digeston significantly decreased average cholesterol content and total lipids.

**Table (9): The effect of using CC on liver activities and some blood plasma parameters.**

| Item | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | SI |
|---|---|---|---|---|---|---|
| Total lipids mg/dl | $455.99^{a}$±3 | $443.7^{a}$±12 | $383.6^{b}$±11 | $379.16^{b}$±8 | $375.5^{b}$±3 | ** |
| Cholesterol mg/dl | 169.7±2.7 | 167.3±3 | 162.8±3.5 | 163.2±1.9 | 160.3±2.4 | NS |
| Total Protein mg/dl | 5.62±0.25 | 5.62±0.21 | 5.79±0.09 | 5.64±0.21 | 5.84±0.18 | NS |
| Albumin mg/dl | 3.96±0.2 | 4.0±0.15 | 4.05±0.1 | 4.14±0.23 | 4.08±0.18 | NS |
| Globulin mg/dl | 1.66±0.05 | 1.62±0.06 | 1.73±0.04 | 1.59±0.09 | 1.63±0.04 | NS |
| A / G Ratio | 2.37±0.06 | 2.47±0.03 | 2.34±0.1 | 2.64±0.3 | 2.50±0.16 | NS |
| GOT U/l | $314.93^{b}$±3 | $319.2^{ab}$±2 | $322.65^{a}$±2 | $325.28^{a}$±1 | $325.8^{a}$±3 | * |
| GPT U/l | $19.37^{c}$±1 | $20.9^{bc}$±1 | $21.6^{bc}$±1.4 | $24.04^{ab}$±1 | $25.1^{a}$±0.9 | * |

**a,b,c,d = Means on the same row under the same treatment differently superscripted are significantly different ( P<0.05 ) SI = Significance. NS = non-significant.**
**$T_1$ control treatment $T_2$ 0.02 / 0.02% CC $T_3$ 0.02 / 0.04 % CC**
**$T_4$ 0.04 / 0.04 % CC $T_5$ 0.04 / 0.06 % CC.**

**Table (10): The Effect of using EG on liver activities and some blood plasma parameters.**

| Item | $T_1$ | $T_6$ | $T_7$ | $T_8$ | $T_9$ | SI |
|---|---|---|---|---|---|---|
| Total lipids mg/dl | 455.99±3 | 456.3±0.7 | 452.75±1 | 457.2±0.3 | 457.1±1.4 | NS |
| Cholesterol mg/dl | $169.66^{a}$±3 | $168.1^{ab}$±1 | $165.8^{ab}$±1 | $164.55^{b}$±1 | $163.3^{b}$±2 | * |
| Total Protein mg/dl | 5.62±0.25 | 5.55±0.06 | 5.58±0.15 | 5.80±0.19 | 5.85±0.16 | NS |
| Albumin mg/dl | 3.96±0.2 | 3.91±0.06 | 3.92±0.15 | 4.12±0.14 | 4.09±0.08 | NS |
| Globulin mg/dl | 1.66±0.05 | 1.64±0.01 | 1.65±0.04 | 1.68±0.05 | 1.62±0.05 | NS |
| A / G Ratio | 2.37±0.06 | 2.42±0.01 | 2.38±0.1 | 2.46±0.03 | 2.53±0.07 | NS |
| GOT U/l | $314.93^{c}$±3 | $319.2^{bc}$±1 | $323^{ab}$±0.8 | $325.33^{a}$±1 | $325.67^{a}$±2 | ** |
| GPT U/l | $19.4^{b}$±0.7 | $22.8^{a}$±0.9 | $22.7^{a}$±0.7 | $22.1^{a}$±0.6 | $22.7^{a}$±0.5 | * |

**a,b,c,d = Means on the same row under the same treatment differently superscripted are significantly different ( P<0.05 ) SI = Significance. NS = non-significant.**
**$T_1$ control treatment $T_2$ 0.02 / 0.02 % EG $T_3$ 0.02 / 0.04 % EG**
**$T_4$ 0.04 / 0.04 % EG $T_5$ 0.04 / 0.06 % EG.**

Also, El-Gendi, (1996) attributed this decrease observed in blood total lipids and cholesterol levels with Egg-plus as herbal feed additives to the decrease that may occur in the rate of total lipids and cholesterol absorption through the intestinal villi that may be reflected as a decrease its levels in the blood.

Generally, these results are in agreement with those of Pescatore, *et al.*, (1990) who reported that the numeric variation in blood parameters (not significantly) could be interpreted due to many factors such as genetic, age, set, physiological state, rearing condition, feeding as well as pathological factors.

From data obtain on the previous blood parameters, it could be concluded that addition of CCL or EGL to broiler diet had no adverse effects on blood constituents, as well as had no deleterious effects on liver function (as measured by GOT and GPT).

**Sensory evaluation (panel test):**

The effect of using CCL or EGL as feed additives in broilers diets on color, taste, aroma and consistency on cooked meat samples obtained from

different position of carcass are presented in Table (11). Both CCL and EGL improved carcass color, taste, aroma and consistency. The best results were recorded with the level of 0.04/0.06% CCL ($T_5$) and the level of 0.04/0.04% EGL ($T_8$).

These results may be due to that CCL leaves is used for treatment of gastro intestinal complaints, and EGL have some properties as antiseptic, antispasmodic and stimulant agent in bronchitis, asthmus minor respiratory complaints. The vapours from boiled leaves are often inhaled in asthma, diabetes, measles and rheumatism (El-Amary, 1993). Or may be because CCL showed an inhibitory effects on growth of ten bacteria species (Toyzyo, *et al.*, (1994).

**Table (11): The effect of using CC or EG as feed additives in broiler diet on sensory values of carcass.**

| Treatment | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | $T_7$ | $T_8$ | $T_9$ |
|---|---|---|---|---|---|---|---|---|---|
| Color | 6 | 7.5 | 7.7 | 8.2 | 9.5 | 7.5 | 7.2 | 9 | 8 |
| Taste | 5.5 | 8.2 | 8.3 | 8.6 | 8.1 | 8.3 | 8.5 | 9 | 8 |
| Aroma | 6.9 | 7.7 | 8 | 8.3 | 8.5 | 7.7 | 7.9 | 9 | 8 |
| Consistency | 6.5 | 7.6 | 7.7 | 8.3 | 8.7 | 7.4 | 7.8 | 8.5 | 7.8 |

$T_1$ Control treatment $T_2$ 0.02 / 0.02% CC $T_3$ 0.02 / 0.04 % CC
$T_4$ 0.04 / 0.04 % CC $T_5$ 0.04 / 0.06 % CC $T_6$ 0.02 / 0.02 % EG
$T_7$ 0.02 / 0.04 % EG $T_8$ 0.04 / 0.04 % EG $T_9$ 0.04 / 0.06 % EG.

**Economic evaluation (REE):**

The results of Relative Economic Efficiency (REEF) of the experimental diets were showed in Table (12). Chicks fed on basal diet + 0.04% EGL ($T_8$) recorded the best (REEF), followed by $T_5$, $T_6$, $T_7$, $T_2$, $T_9$ $T_3$ and $T_4$, respectively, compared to the control group, which recorded the lowest REEF value.

**Table (12): Economic efficiency and relative economic efficiency (REE) of the dietary for experimental treatments.**

| ITEM | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | $T_7$ | $T_8$ | $T_9$ |
|---|---|---|---|---|---|---|---|---|---|
| Body weight gain (kg) | 1.57 | 1.66 | 1.67 | 1.71 | 1.73 | 1.70 | 1.69 | 1.73 | 1.70 |
| Total revenue / chick (LE) | 8.64 | 9.13 | 9.19 | 9.41 | 9.52 | 9.35 | 9.30 | 9.52 | 9.35 |
| Total feed intake / chick (kg) | 3.34 | 3.35 | 3.31 | 3.32 | 3.38 | 3.33 | 3.31 | 3.34 | 3.43 |
| Total feed cost / chick (LE) | 3.65 | 3.68 | 3.73 | 3.87 | 3.67 | 3.58 | 3.60 | 3.65 | 3.80 |
| Price / chick (LE) | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 |
| Total cost / chick (LE) | 5.25 | 5.28 | 5.33 | 5.47 | 5.27 | 5.18 | 5.20 | 5.25 | 5.4 |
| Feed cost/body weight gain(kg) | 2.32 | 2.22 | 2.23 | 2.26 | 2.12 | 2.11 | 2.13 | 2.11 | 2.23 |
| Net revenue / chick (LE) | 3.39 | 3.85 | 3.86 | 3.94 | 4.25 | 4.17 | 4.10 | 4.27 | 3.95 |
| Economic efficiency (EEF) | 0.65 | 0.73 | 0.72 | 0.72 | 0.81 | 0.80 | 0.79 | 0.81 | 0.73 |
| Relative EEF% | 100 | 112 | 111 | 111 | 124 | 123 | 122 | 125 | 112 |

$T_1$ Control treatment $T_2$ 0.02 / 0.02% CC $T_3$ 0.02 / 0.04 % CC
$T_4$ 0.04 / 0.04 % CC $T_5$ 0.04 / 0.06 % CC $T_6$ 0.02 / 0.02 % EG
$T_7$ 0.02 / 0.04 % EG $T_8$ 0.04 / 0.04 % EG $T_9$ 0.04 / 0.06 % EG.

Similar trend was found by El-Gendi, *et al.* (2000) and Abdel-Azeem (2002), who reported that herbal mixtures supplementation increased net revenue of broiler chicks.

## CONCLUSION

From the results obtained in this study, it could be concluded that Cymbopogon citratus can be used in broiler chicks diet at level of 0.04/0.06%, and Eucalyptus globulus at level of 0.04/0.04%. These levels improved LBW, LWG, feed conversion, digestibility coefficient, sensory evaluation and economical efficiency.

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## استخدام بعض النباتات الطبية فى تغذية دجاج التسمين

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أجريت هذه الدراسة على عدد ٢٧٠ كتكوت هابرد عمر أسبوع لدراسة تأثير إضافة بعض النباتات الطبية وهى مسحوق أوراق حشيشة الليمون ومسحوق أوراق الكافور البلدي المجففة كإضافات غذائية على الأداء الإنتاجي لكتاكيت التسمين. غذيت الكتاكيت على عليقتين طبقا" للقرار الوزاري عام ١٩٩٦. العليقه الأولى (بادى/نامي) من عمر يوم حتى ٢٨ يوم وتحتوى على ٢١% بروتين و ٢٩٤٩ كيلو كالورى طاقه ممثله / كجم عليقة. العليقه الثانية (ناهي) من عمر ٢٩يوم حتى عمر ٤٢ يوم وتحتوى على ١٧% بروتين و ٣٠٠٦ كيلو كالورى طاقه ممثله/كجم عليقة. وزعت هذه الكتاكيت عشوائيا" إلى ٩ مجموعات كل مجموعة تحتوي علي ٣٠ كتكوت مقسمين على ٣ مكررات. وكانت مستويات الاضافه كالتالي:

١. عليقة مقارنه (بدون إضافات).
٢. عليقه مقارنه + ٠,٠٢% ورق حشيشة ليمون (نامي وناهي).
٣. عليقه مقارنه + ٠,٠٢% ورق حشيشة ليمون (نامي)، وعليقه مقارنه + ٠,٠٤% ورق حشيشة ليمون (ناهي).
٤. عليقه مقارنه + ٠,٠٤% ورق حشيشة ليمون (نامي وناهي).

٥. عليقه مقارنه + ٠,٠٤% ورق حشيشة ليمون (نامي)، وعليقه مقارنه + ٠,٠٦% ورق حشيشة ليمون (ناهي).
٦. عليقه مقارنه + ٠,٠٢% ورق كافور بلدي (نامي وناهي).
٧. عليقه مقارنه + ٠,٠٢% ورق كافور بلدي (نامي)، وعليقه مقارنه + ٠,٠٤% ورق كافور بلدي (ناهي).
٨. عليقه مقارنه + ٠,٠٤% ورق كافور بلدي (نامي وناهي).
٩. عليقه مقارنه + ٠,٠٤% ورق كافور بلدي (نامي)، وعليقه مقارنه + ٠,٠٦% ورق كافور بلدي (ناهي).

**فيما يلي أهم النتائج التي توصلت إليها الدراسة:-**

١ – وزن الجسم الحي والوزن الناتج وعدد النافق:
زاد كل من وزن الجسم الحي والوزن الناتج بإضافة كل من ورق حشيشة الليمون أو ورق الكافور. وكانت أحسن المعاملات هي التي تحتوى على ٠,٠٤% (بادى/نامى)، ٠,٠٦% (ناهى) أوراق حشيشة الليمون، تحتوي على ٠,٠٤ (بادى/نامى)، ٠,٠٤% (ناهى) ورق كافور بلدي. أما بالنسبة للوزن الناتج فكانت أفضل المعاملات هي التي تحتوى على ٠,٠٤% (بادى/نامى)، ٠,٠٦% (ناهى) ورق حشيشة ليمون. وكانت المجموعة المقارنة هى أقل المجموعات من حيث وزن الجسم الحي والوزن الناتج. كما أنه لا يوجد أي تأثير لأوراق كل من حشيشة الليمون أو ورق الكافور على عدد النافق خلال التجربة حيث كان العدد ٥ – ٦% تقريبا" ويمكن أن يرجع ذلك لأسباب طبيعية.

٢ – الغذاء المأكول ومعامل التحويل الغذائي:
لم يكن هناك أي تأثير معنوي على الغذاء المأكول نتيجة استخدام ورق حشيشة الليمون أو ورق الكافور البلدي كاضافات غذائية وعلى العكس من ذلك فقد تحسن معامل التحويل الغذائي نتيجة هذه المواد.

٣ – المعاملات الهضمية:
أدى استخدام النباتات الطبية المشار إليها فى البحث كإضافات غذائية إلى تحسن معامل هضم كل من المادة الجافة والمادة العضوية والبروتين الخام والمستخلص الخالى من الأزوت ولكنه لم يحسن من معامل هضم مستخلص الأثير والألياف بالمقارنة بمجموعة المقارنة.

٤ – صفات الذبيحة:
استخدام ورق حشيشة الليمون كإضافات غذائية أدى إلى حدوث زيادة معنوية في وزن الذبيحة والقونصة وزيادة الأجزاء المأكولة وأيضا" انخفاض نسبة دهن البطن. أما استخدام ورق الكافور البلدي فلم يؤثر في صفات الذبيحة بينما زاد وزن كل من القلب والقونصة بصوره معنوية كما أدى إلى انخفاض نسبة دهن البطن. أدى استخدام كل من ورق حشيشة الليمون أو ورق الكافور إلى زيادة وزن كل من الطحال وغدة البرسا مما يدل على زيادة المناعة.

٥ – بلازما الدم:
لم يتأثر محتوي البلازما من البروتين أو الجلوبيولين أو الألبيومين بإضافة كل من ورق حشيشة الليمون أو ورق الكافور. فى حين أنخفض مستوى الليبيدات فى ورق حشيشة الليمون وأنخفض مستوى الكوليسترول في حالة ورق الكافور. زاد كل من GOT وGPT في كل من ورق حشيشة اليمون أو ورق الكافور ولكن بدون تأثير ضار على الكبد.

٦ – اختبار التذوق:
تحسن كل من اللون والطعم والرائحة نتيجة استخدام كل من ورق حشيشة الليمون أو ورق الكافور كإضافات غذائية وكانت أفضل المعاملات على الإطلاق من حيث الطعم واللون والرائحة هي المعاملة التي تحتوى على ٠,٠٤% (بادى/نامى)، ٠,٠٦% (ناهى) ورق حشيشة الليمون.

٧ – الكفاءة الاقتصادية:
تحسنت الكفاءة الاقتصادية باستخدام ورق حشيشة الليمون وورق الكافور كإضافات غذائية. وكانت أفضل المعاملات إقتصاديا" هي التي تحتوى على ٠,٠٤/٠,٠٤% ورق كافور.
مما سبق عرضه يتضح أنه يمكن استخدام ورق حشيشة الليمون بكفاءة حتى ٠,٠٤% (بادى/نامى)، ٠,٠٦% ناهى. اما ورق الكافور فيفضل استخدامه بنسبة ٠,٠٤% فى علائق البادى/نامى والناهى.