# EVALUATION OF SOME MEDICINAL HERB MIXTURES AS NATURAL GROWTH PROMTERS IN BROILER DIETS.

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## SUMMARY

Two hundred and ten unsexed one week- old Hubberd broiler chicks were used in this study to evaluate three selected medicinal herbs, Sage leaves, Fennel seeds and Rosemary leaves in three different mixtures as growth promoters in broiler diets. Chicks were randomly assigned to 7 experimental treatments. These consisted of 3 medicinal herb mixtures as follows:

1- Sage leaves 30% + Fennel seeds 20%+Rosemary leaves 50 % ( Mix-1)

2- Sage leaves 50% + Fennel seeds 30%+Rosemary leaves 20 % ( Mix-2)

3- Sage leaves 20% + Fennel seeds 50%+Rosemary leaves 30 % ( Mix-3)

Each mixture was added at two levels (0.25 or 0.50 % DM diet) to broiler diets, in addition to the control (without supplementation). Chemical composition of the experimental herbs (on DM basis) showed that fennel seeds and sage leaves contained more CP% than rosemary leaves (15, 11.2 and 5.5%, respectively). Fennel seeds contained lower CF% than both of sage and rosemary leaves (12.10, 17.90 and 18.90%, respectively). Rosemary leaves and fennel seed contained more EE% than sage leaves (14.99, 14.2 and 4%, respectively). According to the detected active constituents, the major components of essential oils were cineole and camphor in sage and rosemary leaves, while anethole and fenchone were the major components in fennel seeds. Supplementing the diets with Mix1 at 0.25% and Mix3 at 0.25 or 0.50% improved body weight gain, feed conversion values and decreased feed intake, numerically, after 21 days of age. These treatments resulted also in better performance index and least cost of feed/kg body gain during the total period as compared with the control. The best feed conversion, performance index and least cost of feed/kg body gain during the total period were observed for Mix3 at 0.50% of the diet. Mix3 at 0.25 or 0.50% improved significantly ($P \leq 0.05$) the digestibility coefficient of CP. Empty carcass values were improved significantly ($P \leq 0.05$), as compared with the control, by adding Mix1 or Mix3 at 0.25%. All the studied growth promoters decreased significantly ($P \leq 0.05$) abdominal fat, total bacterial count in chicken meat and total plasma lipids. Mix2 resulted in less acceptable chicken meat, while the highest values were detected for Mix1 at 0.25% and Mix3 at 0.25 or 0.50%. Tested mixtures had no deleterious effects on kidneys or liver functions. Therefore, in the light of this study, till more investigation, it is recommended to use Mix1 at 0.25% as well as Mix3 at 0.25 or 0.50% of broiler diet as natural growth promoter to get best performance, meat quality and least cost of feed/kg body gain.

***Keywords:*** *broilers, sage leaves, fennel seeds, rosemary leaves, medicinal herb mixtures, performance, essential oil.*

## INTRODUCTION

Nowadays, the poultry industry has focus more attention towards addressing public concern for environmental and food safety. The antibiotic growth promoters have been under scrutiny for many years and have been removed from the market in many countries (Ratcliff, 2000). Their use may contribute to antibiotic resistant bacteria that cause concerns (Philips, 1999). In light of this situation, the feed manufacturers and the poultry producers have been actively looking to an efficacious alternative to antibiotic growth promoters. Many herbs have been recognized to have medicinal properties and possess many beneficial effects on health, such as antioxidant activity, digestive stimulant action, anti-inflammatory, antimicrobial, hypolipidemic, antimutagenic, anticarcinogenic potential (Srinivasan, 2005; Pizzale *et al,* 2002 and Lampe, 2003). Nikil-burskii (1992) found that feeding ducks on diet containing 3% wastes from sage (*salvia sclarea*) processed for essential oil production increased live weight gain. Ghazalah and Ali (2008) fed Arbor Acres broiler chicks on diets supplemented with rosemary leaves at levels of 0.5 %, 1.0% or 2.0% and found that, the best overall bird performance was obtained by feeding broiler chicken diets supplemented with 0.5% rosemary. Nichita *et al.* (1984) found that after extraction of fennel seed, the residue was given at 0.5, 1.0 and 2.0% in the diet for growing chickens and mean daily gain was 85.3, 80.8, and 85.9 g, respectively. Feed conversion ratio (FCR) was lower for chickens given 0.5% fennel. Steiner and Rouault (2009) revealed that most of the effects of phytogenics seem to be dose-dependent and they suggested that a well-balanced and scientifically developed combination of active ingredients with different properties can be expected to function synergistically in order to bring about the desired benefits for the producer. Basmacoglu *et al* (2004) conducted a study to compare the effects of feeding oregano and rosemary essential oils, fed either individually or in combination with alpha -tocopheryl acetate on the performance parameters and lipid oxidation of broiler meat. They indicated that there is a possible synergistic effect between oregano and rosemary essential oil in preventing lipid oxidation in stored meat. Therefore, this study aimed at evaluating three selected medicinal herbs, sage leaves, fennel seeds and rosemary leaves in three different mixtures as growth promoters in broiler diets.

## MATERIALS AND METHODS

The experimental part of the present study was carried out at Gizerat El-Sheir poultry research station, El-Kanater El-Khairia. The laboratory work was done at Poultry Nutrition Department, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Dokki, Giza, Egypt. Three selected medicinal were used: herbs, sage leaves (*Salvia officinalis*), rosemary leaves (*Rosmarinus officinalis*) and fennel seeds (*Foeniculum vulgare*) in three different mixtures as growth promoters in broiler diets. Two hundred and ten unsexed one week old Hubberd broiler chicks were randomly assigned to 7 experimental treatments in 3 replicates. The treatments consisted of 3 medicinal herb mixtures: 1- Sage leaves 30% + Fennel seeds 20%+Rosemary leaves 50 % ( Mix1), 2- Sage leaves 50% + Fennel seeds 30%+Rosemary leaves 20 % ( Mix2), and 3- Sage leaves

20% + Fennel seeds 50%+Rosemary leaves 30 % ( Mix3). Each mixture was used to substitute 0.25 and 0.50 % of the total feed mixture, mainly wheat bran, in addition to the control (without supplementation). Two experimental diets

**Table (1): Composition and calculated analysis of control diets.**

Formulated according to the requirements of Hubberd broilers catalogue.

**Each 1 kg of diet contains: Vit. A 16000 IU, Vit .$D_3$ 2933 IU, Vit .E 27 mg, Vit .$K_3$ 2.67 mg, Vit. $B_1$ 4 mg, Vit. $B_2$ 8 mg, Vit. $B_6$ 5.33 mg, Vit. $B_{12}$ 0.04 mg, Niacin 40 mg, Pantothenic acid 16 mg. Folic acid 2 mg, Biotin

| Ingredients % | Starter (7-21days of age) | Finisher (21-42 days of age) |
|---|---|---|
| Yellow corn | 55.36 | 60.15 |
| Soybean meal (44%) | 26.80 | 20.54 |
| Corn gluten (60%) | 8.90 | 8.90 |
| Wheat bran | 1.50 | 3.25 |
| Canola oil | 3.00 | 3.00 |
| Calcium carbonate | 1.00 | 1.00 |
| Di-Calcium phosphate | 2.25 | 1.87 |
| Sodium chloride | 0.43 | 0.43 |
| Vit. and Min. mix** | 0.40 | 0.40 |
| L-lysine (HCL) | 0.23 | 0.31 |
| DL-Methionine | 0.13 | 0.15 |
| Total | 100 | 100 |
| Price L E / ton | 2087 | 2010 |
| Calculated analysis | | |
| Metabolizable energy (kcal ME / kg diet ) | 3103 | 3150 |
| Crude protein (%) | 22.09 | 20.05 |
| C/P ratio | 140.5 | 157.1 |
| Ether extract (%) | 2.76 | 2.92 |
| Crude fiber (%) | 3.57 | 3.42 |
| Calcium (%) | 1.02 | 0.92 |
| Available phosphorus (%) | 0.51 | 0.44 |
| Methionine (%) | 0.57 | 0.56 |
| Lysine (%) | 1.20 | 1.10 |
| Meth + Cys (%) | 0.94 | 0.90 |

*0.1067 mg, Choline chloride 933.3mg, Manganese 106.66 mg, Copper 13.33 mg, Iron 60 mg, Zinc 93.33 mg, Selenium 0.2666 mg , Iodine 2 mg and Cobalt 0.333 mg.*

were used in the two stages of this study (7-21 and 21-42 days of age). The diet contained 22% CP and 3100 Kcal ME /Kg was offered during the first stage and that contained 20% CP and 3150 Kcal ME /Kg was fed during the second stage (Table 1). All groups were nearly equal in initial average live weight (130g) and kept under similar management conditions. Medicinal herbs were purchased from local market and ground just before using. The diets were formulated to meet the nutrient requirements of the chicks according to the strain catalog recommendation. Artificial light was used beside the normal day light to provide 24-hour / day photoperiod. Feed and water were provided *ad . bitum*. Feed

consumption and body weight of the birds were measured during the experimental periods. Body weight gain, feed conversion, and feed cost/kg weight gain (LE) were calculated. Performance index was calculated according to the equation described by North (1981).

The nutrient digestibilities of the experimental diets were examined using 3 male birds from each treatment at the end of the experimental period (at the $6^{th}$ weeks of age). Faecal nitrogen was determined according to the method outlined by Jakobsen *et al.* (1960), while the urinary organic matter fraction was calculated according to Abou-Raya and Galal (1971). The proximate analyses of tested additives, feed and dried excreta were carried out according to the official methods (AOAC, 1990).

Essential oil content of sage leaves, rosemary leaves and fennel seeds , were determined according to the method described by Guenther, (1961). Chemical composition of essential oil samples were estimated using gas liquid chromatography (GLC) (Donamds chrom 6200).

At the end of the $6^{th}$ weeks of age, 3 birds were chosen randomly from each treatment for blood plasma parameters, slaughter test, organoleptic evaluation of cooked chicken meat and total bacterial count in chicken meat (meat+ skin). Individual blood samples were taken from jugular vein of 3 male birds within each treatment. The blood samples were centrifuged immediately after collection at 3000/rpm for 20 min. and plasma were transferred into clean tubes and stored in a deep freezer at approximately $-20^{\circ}C$ till the time of chemical analysis. Chemical analysis of blood plasma were carried out for quantitative determination of plasma total lipids, cholesterol, LDL, HDL, total protein, albumin, uric acid , ALT and AST using commercial kits, following the same steps as described by manufactures. The assigned birds for slaughter test were deprived of feed for 16 hours prior slaughter and carcass weights were calculated as a percentage of live body weight. Organoleptic evaluation of cooked chicken meat was carried out according to Molander(1960). Total bacterial count in chicken meat (meat+ skin) was measured as described by Harrigan(1998).

Data from all the response variables were subjected to analysis of variance (SAS, 1993). Variables having a significant F-test ($P \leq 0.05$) were compared using Duncan's Multiple Range Test (Duncan 1955).

In this study, the following model was used for analyzing data obtained.

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where: $Y_{ij}$ = the individual observation, $\mu$ = the overall mean, $T_i$ = the effect of treatment ($i=1,\ldots, 7$), $e_{ij}$ = the experimental error.

## RESULTS AND DISCUSSION

***Chemical composition of the experimental herbs:***

Chemical composition of the experimental herbs (on DM basis) is shown in Table 2. Fennel seeds and sage leaves contained more CP% than rosemary leaves, the values were 15, 11.2 and 5.5%, respectively. The herbs were also different in their EE content, where rosemary leaves and fennel seeds contained more EE% than sage leaves. The values were 14.99, 14.2 and 4%, respectively. Sage contained more ash than the other two herbs (11.50 vs. 8.10%), while fennel seeds contained lower CF% than both of sage leaves and rosemary leaves (12.10, 17.90 and 18.90%, respectively). The obtained values were very close to those reported by Nichita *et al.* (1984); Nikil-burskii (1992), Ibrahim *et al.* (2002), Eisa (2004) and Ghazalah and Ali (2008).

**Table (2): Chemical analyses of the experimental herbs (on DM basis).**

| Item | | Sage | Rosemary | Fennel |
|---|---|---|---|---|
| Moisture | (%) | 10.40 | 8.90 | 11.30 |
| Organic matter | (OM %) | 88.50 | 91.90 | 92.00 |
| Crude protein | (CP %) | 11.20 | 5.50 | 15.00 |
| Ether extract | (EE %) | 4.00 | 14.99 | 14.20 |
| Crude fiber | (CF %) | 17.90 | 18.90 | 12.10 |
| Nitrogen free extract | (NFE%) | 55.40 | 52.51 | 50.70 |
| Ash | (%) | 11.50 | 8.10 | 8.00 |

***Active constituents of the experimental herbs:***

The calculated amounts of the essential oil and active constituents for the experimental herb and their mixtures are shown in Table 3. Both of fennel seeds and rosemary leaves contained higher essential oil % than sage leaves being 1.8, 1.5 and 1.15%, respectively. These resulted in 1.46, 1.42 and 1.58% essential oil in Mix1, Mix2 and Mix3, respectively. According to the detected active constituents, the major components of essential oils were cineole and camphor for sage and rosemary leaves, while they were anethole and fenchone in fennel seeds, ( Table 3). The major active constituents for the essential oils of the prepared mixtures were related to their concentrations in the individual herbs, where Mix1 contained cineole (23.51%), anethole (14.37%) and camphor (13.31%), while Mix2 contained anethole (21.56%), cineole (19.7%) and camphor (9.51%), beside Mix3 which contained anethole (35.93%), cineole (14.65%) and camphor (8.21%).

The obtained values of essential oil (%) were in the range found by Simon *et al* (1984) who found that sage oil extracted by steam distillation ranged from 1.2 to 2.5 %. In addition, Ghazalah and Ali (2008) found a range of 1.4 - 1.6% essential oil for rosemary

leaves. Moreover, Karlsen *et al.*(1969) found a range of 1.4 - 1.6% essential oil for fennel seeds. Almost similar active constituents were also reported by Guillen *et al* (1996). The authors found that the essential oil of sage leaves contained high ratio of cineole (26.9%) and camphor (14.4 to 35.9 %) as main components. Also, Ghazalah and Ali (2008) observed that the essential oil of rosemary contained camphor (16%), and cineole (30-35%). Beside Mata *et al* (2007) showed that the main compound in fennel essential oil was anethole, being 70.2%.

**Table (3): Essential oils and active constituents of experimental herbs and mixtures (on AD basis).**

| Herbs | Sage | Rosemary | Fennel | Mix1 | Mix2 | Mix3 |
|---|---|---|---|---|---|---|
| **Essential oil %** | 1.15 | 1.5 | 1.8 | 1.46 | 1.42 | 1.58 |
| Cineole | 27.09 | 30.77 | - | 23.51 | 19.7 | 14.65 |
| Camphor | 11.01 | 20.02 | - | 13.31 | 9.51 | 8.21 |
| Terpeniol | 3.77 | - | - | 1.13 | 0.89 | 0.75 |
| Linalyl-acetate | 4.23 | - | - | 1.27 | 2.12 | 0.85 |
| Geraniol | 1.61 | - | - | 0.48 | 0.81 | 0.32 |
| ı-ald ehyde | 0.36 | - | - | 0.11 | 0.18 | 0.07 |
| α- pinene | - | 3.66 | - | 1.83 | 0.73 | 1.10 |
| Camphene | - | 2.41 | 0.09 | 1.22 | 0.51 | 0.77 |
| Linaloal | - | 0.92 | - | 0.46 | 0.18 | 0.28 |
| Borneol | - | 0.46 | - | 0.23 | 0.09 | 0.14 |
| Limonene | - | 0.30 | 3.27 | 0.80 | 1.04 | 1.73 |
| Anethole | - | - | 71.86 | 14.37 | 21.56 | 35.93 |
| Fenchone | - | - | 7.62 | 1.52 | 2.29 | 3.81 |
| Methyl-chavicole | - | - | 2.39 | 0.48 | 0.72 | 1.20 |

***Growth performance:***

Table 4 revealed that during the first stage (7-21 days of age) of this study, the prepared herbal mixtures had no significant effect on live body weight gain, while it was affected ($P \leq 0.05$) during the second stage (21-42 days). Consequently during the entire period (7-42 days of age) addition of Mix1 at 0.25% of the diet or Mix3 at both levels (0.25 or 0.50%) resulted in preferable values of body gain than the control. The values were 964, 982 and 968 vs.933 g. between 4-6 weeks and 1355, 1394 and 1359 vs. 1346 g., respectively. Increasing the proportion of sage leaves (Mix2) or rosemary leaves (Mix1) up to 50% in the mixtures resulted in less body gain values comparable to those obtained from Mix3 which contained 50% fennel seeds. The reduction was more obvious for Mix1 at 0.50% and Mix2 at 0.25%.

The experimental mixtures did not affect significantly the amounts of feed consumed during the first stage of this experiment (7-21 days of age). While all additives decreased, in general, the values during the second stage and the entire period as compared with those of the control. The least ($P \leq 0.05$) values were observed for Mix1 and Mix3 at 0.50% of the diet. The total values were 3055 and 3042 vs. 3231 g., respectively during the entire period

of the experiment. Mix3 at 0.25% did not decrease significantly ($P \leq 0.05$) the feed consumed and resulted in very close value with the control diet (2440 vs. 2482 g.).

No improvement in feed conversion values was noticed during the first 3 weeks of age, due to the additives compared to the control diet. Supplementing the diets with Mix1 at 0.25% and Mix3 at 0.25 or 0.50% improved feed conversion values significantly ($P \leq 0.01$) between 21-42 days of age, while during the entire period; the improvement was significant ($P \leq 0.05$) for Mix3 at 0.50% of the diet as compared with the control. The values were 2.24 vs. 2.40 kg feed /kg gain, respectively.

Performance index values during the entire period ranged between 57.93 for Mix1 at 0.50% and 66.47% for Mix3 at 0.50%. The best values were 66.47, 65.97 and 64.20% for Mix3 at 0.50, 0.25 and Mix1 at 0.25%, respectively compared to the control diet (61.42%).

Total feed cost (LE)/kg weight gain followed the same trend as performance index, where the least feed cost (LE)/kg weight gain value was 4.69 LE for Mix3 at 0.50%, while Mix1 and Mix3 at 0.25% gave the same value (4.76 LE). The previous results indicated that Mix3 at 0.50% of the diet gave the best performance and least feed cost (LE)/kg weight gain.

The improving effect of Mix3 which contained high level of fennel seeds was supported by Abdel -Latif *et al* (2002) who reported that adding fennel seeds to Japanese quail diet at a level of 100 gm / ton, diet improved body weight, body weight gain and feed conversion. Tollba (2003) found that feeding chicks on diets containing 1 % fennel seeds increased live body weight and weight gain. Also, Abdullah and Rabia (2009) showed that the supplementation of fennel seeds at 1, 2 and 3 g/kg of broiler diet improved feed conversion ratio. The importance of the other two medicinal plants was supported by Ibrahim *et al* (2002) who reported that sage leaves at 0.5% increased the final body weight and body weight gain of rabbits. In addition, Al – Kassie *et al* (2008) observed that, feeding broiler chickens on diet contained 0.1% rosemary leaves improved weight gain. The active constituents anethole and methyl chavicole which were relatively high in Mix3 found to have digestive stimulating and appetizing effects (Cabuk *et al.*, 2003). Also, El-Deek *et al.* (2003) noted that the anethole affected pathogen microorganisms in digestive system and increased live body weight and improved feed conversion ratio. Notable, Rowiha (1994) stated that using mixture of medicinal and aromatic herbs was preferable than using individual herbs.

***Nutrients digestibility:***

Digestibility of EE% and CF% (Table 5) were not significantly affected by the experimental herbal mixtures.While. Mix1 at 0.25% and Mix3 at 0.25 or 0.50% of the diet resulted in higher digestibility values than the control diet for the other items. Mix3 at 0.25 or 0.50% improved significantly ($P \leq 0.05$) the digestibility of CP as compared to the control. In this regard, Charles *et al.* (1993) and Hashim *et al.* (1999) showed that fennel is a sweet herb used to promote functions of the spleen, liver, and kidneys and regulate the peristaltic function of the gastrointestinal tract, thereby increasing the passage of gases, thus relieves spasms of the intestines.

**Table (4): Effect of herbal mixtures on broiler performance and feed cost/kg weight gain**

| Parameter | T1 Control | T2 (Mix-1) 0. 25% | T3 (Mix-1) 0. 5% | T4 (Mix-2) 0.25% | T5 (Mix-2) 0. 5% | T6 (Mix-3) 0.25% | T7 (Mix-3) 0. 5% | Sign |
|---|---|---|---|---|---|---|---|---|
| Weight gain (g) | | | | | | | | |
| 1-4 weeks | 413 ±11.45 | 391 11.54± | 414 11.54± | 389 ±11.54 | 396 ± 11.54 | 412 11.54± | 391 11.54± | NS |
| 4-6 weeks | 933[a] ±6.06 | 964[a] 10.68± | 852[b] 12.41± | 911[ab] ±8.41 | 927[a] ±12.99 | 982[a] ±12.70 | 968[a] ±11.83 | * |
| 1-6 weeks | 1346[ab] 28.31± | 1355[ab] 15.18± | 1266[c] 27.08± | 1300[bc] ±24.72 | 1323[ab] ±6.42 | 1394[a] ±34.06 | 1359[ab] ±18.32 | * |
| Feed intake (g) | | | | | | | | |
| 1-4 weeks | 749 9.01± | 744 14.16± | 741 39.80± | 757 17.03± | 775 30.98± | 774 12.89± | 742 ±1.45 | NS |
| 4-6 weeks | 2482[a] ±7.02 | 2391[abc] 17.13± | 2314[bc] 41.14± | 2364[abc] ±29.89 | 2459[a] 36.96± | 2440[ab] 15.93± | 2300[c] ±51.05 | * |
| 1-6 weeks | 3231[a] ±9.16 | 3135[ab] 20.79± | 3055[b] ±14.84 | 3121[ab] ±46.72 | 3234[a] ±35.23 | 3214[a] 58.15± | 3042[b] ±8.54 | * |
| Feed conversion | | | | | | | | |
| 1-4 weeks | 1.81[b] ±0.07 | 1.90[ab] 0.01± | 1.79[b] ±0.01 | 1.95[a] ±0.01 | 1.96[a] ±0.01 | 1.88[ab] 0.01± | 1.90[ab] ±0.01 | * |
| 4-6 weeks | 2.66[ab] 0.02± | 2.48[c] ±0.03 | 2.72[a] 0.05± | 2.59[b] ±0.03 | 2.65[ab] ±0.02 | 2.48[c] 0.01± | 2.38[c] ±0.02 | ** |
| 1-6 weeks | 2.40[ab] 0.20± | 2.31[abc] ±0.07 | 2.41[ab] 0.02± | 2.40[ab] ±0.05 | 2.44[a] ±0.25 | 2.31[abc] 0.06± | 2.24[c] ±0.05 | * |
| Performance index %[1] | 61.42 | 64.20 | 57.93 | 59.54 | 59.51 | 65.97 | 66.47 | |
| Total feed cost / chick ( LE) | 6.55 | 6.48 | 6.45 | 6.42 | 6.78 | 6.62 | 6.38 | |
| Feed cost/ kg weight gain (LE) | 4.85 | 4.76 | 5.08 | 4.94 | 5.14 | 4.76 | 4.69 | |

ton wheat bran (850 LE) , herbal Mix1 (16000 LE), herbal Mix2 (14000 LE) and herbal Mix3 (13000 LE),

1- Performance index= (final live body weight (kg)/feed conversion) x 100

The price of one ton wheat bran (850 LE) , herbal Mix1 (16000 LE), herbal Mix2 (14000 LE) and herbal Mix3 (13000 LE),

1- Performance index= (final live body weight (kg)/feed conversion) x 100

The results were supported by Charles *et al.* (1993) who showed that, a fennel seed which is the main component of Mix3 is well known as a digestive aid and it may be given in small quantities to help digest carbohydrates. Bown (2001) and El-Deek *et al.* (2003) indicated that fennel seeds stimulate the flow of digestive juice in the stomach and intestine and increase the efficiency of broken fats to fatty acids. Also, Ibrahim *et al* (2002) showed that addition of 0.5% and 1.0% sage leaves to rabbit's diet improved nutrients digestibility comparing with control group. Hernandez *et al.* (2004) reported that supplementation of 5000 ppm *labiatae* extract from (sage, thyme and rosemary leaves), to broiler diets improved apparent whole-tract and ileal digestibility of the nutrients significantly except for crude protein digestibility. Moreover, Jamroz and Kamel, (2002) stated that anethole which constitutes high level of fennel essential oil found to increase the digestion of protein. Anethole and estragole (or chavicole), which constitute relatively higher percentages of Mix3, found to have digestive stimulating and appetizing effects (Cabuk *et al.*, 2003). Anethole, also increases the effects of pancreatic lipase and amylase (Ramakrishna *et al.*, 2003). It is worthy to note that Mix3 contained higher level of limonene and intermediate level of camphene as compared with the other two mixtures (Table 3). These compounds found to enhance the digestion process (Hegazy *et al.*, 1997). Mix3 contained the least level of camphor and intermediate level of borneol as compared with the other two mixtures (Table 3). These compounds aid the digestive system by stimulating the production of gastric juices (Zhong, 1990). Also, linaloale constitutes an intermediate level of Mix3 essential oil (Table 3). This compound is often employed for deducing the activation of cholinergic system, hence, possibly prevent constitution of fatty liver, consequently improving liver function (Hegazy *et al.*, 1997).

***Carcass characteristics:***

Table (6) showed that carcass characteristics values were affected significantly by the treatments. Empty carcass values (without shanks and head) as percentage of live body weight were improved significantly ($P \leq 0.05$), as compared with the control, by adding Mix1 or Mix3 at 0.25%. While Mix1, Mix2 and Mix3 at 0.25% increased total edible parts values (%), significantly ($P \leq 0.05$) as compared with the control. Empty carcass values were ranged between 69.48 and 76.23%. Notable total edible parts included empty carcass plus giblets (empty gizzard, liver and heart). All additives decreased abdominal fat significantly ($P \leq 0.05$) compared with the control. The least value was detected for Mix2 at 0.50%. Herbal mixtures resulted in a range between 0.68-1.07 vs. 1.39% for the control.

In this regard, Fritz *et al.* (1992) reported that diets supplemented with 1.5 to 3 % herb mixture containing 30% sage leaves decreased some carcass dressing percentage indices as compared to the control. Ghazalah and Ali (2008) found that adding 2% rosemary leaves to broiler diets reduced abdominal fat. Ibrahim *et al.* (2002) showed that addition of 0.50% and 1.0% sage leaves to rabbit diets increased eviscerated body weight and liver weight compared to the control group. On the contrary to the obtained results, Abdullah and Rabia

**Table (5): Effect of herbal mixtures on the digestion coefficients of nutrients.**

| Item | T1 Control | T2 (Mix-1) 0. 25% | T3 (Mix-1) 0. 5% | T4 (Mix-2) 0.25% | T5 (Mix-2) 0. 5% | T6 (Mix-3) 0.25% | T7 (Mix-3) 0. 5% | Sign |
|---|---|---|---|---|---|---|---|---|
| DM % | $74.58^{bC}$ ± 0.95 | $77.28^{ab}$ ±1.00 | $72.18^{c}$ ±1.20 | $73.41^{c}$ ± 0.51 | $74.61^{bc}$ ±2.04 | $78.20^{ab}$ ±1.45 | $79.14^{a}$ ±0.95 | * |
| OM % | $80.16^{bC}$ ±0.69 | $81.14^{abc}$ ±0.69 | $78.44^{c}$ ±1.10 | $79.07^{c}$ ±0.69 | $79.31^{c}$ ±1.00 | $82.82^{ab}$ ±0.69 | $83.18^{a}$ ±1.27 | * |
| CP % | $82.40^{C}$ ±0.64 | $84.91^{a}$ ±0.03 | $81.67^{c}$ ±0.63 | $82.79^{bc}$ ±0.64 | $84.45^{ab}$ ±2.82 | $85.98^{a}$ ±0.62 | $85.11^{a}$ ±0.99 | * |
| EE % | 77.93 ±1.44 | 77.86 ±1.44 | 75.55 ±1.44 | 76.20 ±1.42 | 76.74 ±0.65 | 76.86 ±1.44 | 75.16 ±0.93 | NS |
| CF% | 25.33 ±1.50 | 25.82 ±1.50 | 24.45 ±1.50 | 25.23 ±1.52 | 25.58 ±1.51 | 25.78 ±1.22 | 25.45 ±1.91 | NS |
| NFE% | $80.51^{C}$ ±0.46 | $84.93^{ab}$ ±0.53 | $81.12^{c}$ ±0.46 | $81.89^{bc}$ ±0.69 | $83.86^{abc}$ ±1.55 | $85.18^{ab}$ ±0.85 | $85.77^{a}$ ±0.42 | * |

*a, b..means in the same row differently superscripted are significantly different (P≤0.05 or P≤0.01) ± SE.*

*NS = Not significant* ** = significant (P≤0.05 ).*

(2009) found that addition of 1, 2 and 3 g/kg fennel seeds to the broiler diets resulted in no significant differences in all carcasses characteristics.

***Total bacterial count in chicken meat:***

Total bacterial count in chicken meat decreased significantly ($P \leq 0.01$) by adding all herbal mixtures, the values were between 2.00 for Mix1 at 0.50% and 3.73 for Mix2 at 0.25% vs. 7.20 for the control (Table 6). In agreement to the results of this study, Aksit *et al* (2006) added essential oil plus organic acid to broiler feed and showed that supplementation of essential oil could be beneficial to reduce microbiological load thus preventing food poisoning and early spoilage of chicken meat. Also, Stern *et al.* (2001) revealed that elimination of pathogen organisms from broilers using some materials, such as essential oils before they reach the processing plant, will improve the chances of producing processed carcasses free from microorganisms.

***Organoleptic properties of chicken meat:***

Overall acceptability values of chicken meat representing organoleptic properties are shown in Table 6. Mix2 resulted in less acceptable chicken meat, while the other mixtures gave comparable or more acceptable chicken meat as compared with the control. The highest values were those of Mix1 at 0.25% and Mix3 at 0.25 or 0.50%. The effect of herbs on organoleptic properties of chicken meat are confirmed by El-Deek *et al.* (2003) who reported that colour intensity of chicken meat was significantly improved when a mixture of 0.1% of anise plus fennel was supplemented to Hubbard broiler diet. In addition, Ghazalah and Ali (2008) reported that feeding Arbor Acres broiler chicks on diets supplemented with 0.5% rosemary leaves recorded the best consumer acceptability of the poultry meat.

***Blood plasma parameters:***

Addition of all herbal mixtures decreased total lipids and cholesterol values compared with the control (Table 7). The decrease was significantly ($P \leq 0.01$) in total lipids for all mixtures, while the significant ($P \leq 0.05$) decrease in cholesterol levels was noticed for Mix3 at either 0.25 or 0.50%. The tested mixtures had no deleterious effects on kidneys (as measured by uric acid) or liver function (as measured by AST and ALT).

The present values of blood total cholesterol were within the normal range which published by Meluzzi *et al.* (1992) for broiler chicks (87 – 194 mg/dl). The essential oils (from aromatic plants) found to inhibit hepatic 3-hydoxy-3-methylglutaryl coenzyme A (HMG-Co A) reducatase activity which is a key regulatory enzyme in cholesterol synthesis, (Crowell, 1999). Also, Lanksy *et al.* (1993 ) reported that, the decrease in plasma content of total cholesterol and LDL may reflect the hypocholestrolemic properties attributed to the defatted part of the leaves of rosemary which are rich in fibrous content and may block intestinal cholesterol absorption. The obtained results were supported by Ibrahim *et al.* (2002) who fed growing rabbits on diets without or with 0.50% and 1.0% sage leaves .The total blood lipids and cholesterol of rabbits received medicinal plants were decreased significantly. Tollba (2003) noted that feeding broiler on fennel seeds decreased the concentration of cholesterol and total lipids. Also, Ghazalah and Ali (2008) found that addition of 0.5% rosemary leaves to broiler diets decrease total lipids and cholesterol content.

**Table (6): Effect of herbal mixtures on carcass characteristics, total bacterial count and organoleptic properties.**

| Parameters | T1 Control | T2 (Mix-1) 0. 25% | T3 (Mix-1) 0. 5% | T4 (Mix-2) 0.25% | T5 (Mix-2) 0. 5% | T6 (Mix-3) 0.25% | T7 (Mix-3) 0. 5% | Sign |
|---|---|---|---|---|---|---|---|---|
| Carcass (% ) | $70.24^{bc}$ ±2.24 | $76.23^{a}$ ±1.36 | $69.48^{c}$ ±1.36 | $74.48^{ab}$ ±1.58 | $74.32^{ab}$ ±0.73 | $75.13^{a}$ ±0.26 | $73.25^{abc}$ ±0.35 | * |
| Total edible parts (%) | $75.86^{bc}$ ±1.51 | $82.19^{a}$ ±1.09 | $74.73^{c}$ ±2.26 | $80.30^{a}$ ±0.94 | $79.92^{ab}$ ±0.86 | $80.21^{a}$ ±1.19 | $79.05^{ab}$ ±0.78 | * |
| Abdominal fat (%) | $1.39^{a}$ ±0.04 | $1.07^{b}$ ±0.07 | $0.93^{bc}$ ±0.04 | $0.91^{bc}$ ±0.08 | $0.68^{c}$ ±0.04 | $0.99^{b}$ ±0.14 | $0.88^{bc}$ ±0.13 | ** |
| Total bacterial count ($x10^4$) in meat | $7.20^{a}$ ±1.15 | $2.90^{b}$ ±0.57 | $2.00^{b}$ ±0.57 | $3.73^{b}$ ±0.64 | $2.40^{b}$ ±0.46 | $2.67^{b}$ ±0.72 | $2.50^{b}$ ±0.69 | ** |
| Overall acceptability of meat | $7.67^{ab}$ ±0.33 | $8.33^{a}$ ±0.33 | $7.67^{b}$ ±0.33 | $6.33^{c}$ ±0.33 | $6.67^{bc}$ ±0.33 | $8.00^{a}$ ±0.57 | $8.33^{a}$ ±0.33 | * |

*a, b..... means in the same row differently superscripted are significantly different (P≤0.05 or P≤0.01) ± SE.*

** = significant (P≤0.05 ).* *** = highly significant (P≤0.01 ).*

**Table (7): Effect of herbal mixtures on some blood plasma parameters.**

| Parameter | T1 Control | T2 (Mix-1) 0. 25% | T3 (Mix-1) 0. 5% | T4 (Mix-2) 0.25% | T5 (Mix-2) 0. 5% | T6 (Mix-3) 0.25% | T7 (Mix-3) 0. 5% | Sign |
|---|---|---|---|---|---|---|---|---|
| **Total Lipids (mg/dl)** | 509.67 [a] ± 9.38 | 378.33 [b] ±13.28 | 435.33[b] ±0.88 | 420.00 [b] ±15.04 | 434.33[b] ± 6.74 | 403.67 [b] ± 11.78 | 381.33 [b] ±38.64 | ** |
| **Total Cholesterol (mg/dl)** | 194.00[a] 10.78 | 157.67 [ab] ±17.02 | 174.33 [ab] ±8.41 | 164.00 [ab] ±16.25 | 188.67[a] ±16.47 | 137.67[b] ±4.66 | 137.33[b] ±3.52 | * |
| **Kidney function** | | | | | | | | |
| Uric Acid (mg/dl) | 4.25 ±0.27 | 4.24 ±0.68 | 4.31 ±0.44 | 4.26 ±0.37 | 4.27 ±0.39 | 4.49 ±0.20 | 4.23 ±0.55 | NS |
| **Liver function** | | | | | | | | |
| AST[1] (u/l) | 128.67[a] ±0.57 | 118.67[d] ±0.88 | 128.33 [a] ±0.57 | 125.67 [b] ±0.57 | 127.33[ab] ±0.88 | 113.33[e] ±0.57 | 121.33[c] ±0.33 | ** |
| ALT[2] (u/l) | 21.00[a] ±0.66 | 16.33[bc] ±1.52 | 19.00[ab] ±0.66 | 17.67[abc] ±0.57 | 17.00[bc] ±1.76 | 15.33[c] ±1.33 | 17.33[bc] ±1.15 | * |

*AST[1] : Aspartic Amino Transferase* *ALT[2] : Alanine Amino Transferas*

*a, b..... means in the same row differently superscripted are significantly different (P≤0.01) ± SE.*

*NS: Not significant* ** : significant (P≤0.05).* *** : high significant (P≤0.01).*

Radwan *et al.* (2008) reported that, addition of 1.0% rosemary leaves to laying hens diets decreased total lipids; total cholesterol and LDL- cholesterol in blood. Tollba (2003) found that feeding broiler on fennel seeds decreased the concentration of AST and ALT compared to those un-supplemented groups.

Therefore, in the light of this study, till more investigation, it is recommended to use Mix1 (Sage leaves 30% + Fennel seeds 20%+Rosemary leaves 50 %) at 0.25% as well as Mix3 (Sage leaves 20% + Fennel seeds 50%+Rosemary leaves 30 %) at 0.25 or 0.50% of broiler diet to get best performance, meat quality and least cost of feed/kg body gain.

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# تقييم بعض خلطات الأعشاب الطبية كمنشطات نمو طبيعية فى علائق دجاج اللحم

**عادل زكى محمد سليمان[1]، ناجى يونان عبد الملاك[2] ، محمد احمد فؤاد المنيلاوى[1] و هبه حامد مصطفى حبيب[2]**

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استخدم فى هذه الدراسة عدد 210 كتكوت هبرد غير مجنس عمر أسبوع بهدف تقييم ثلاثة أعشاب طبية مختارة هى أوراق المريمية و أوراق حصى لبان و بذور الشمر وذلك فى ثلاث خلطات مختلفة كمنشطات نمو فى علائق دجاج اللحم.

تم توزيع الكتاكيت عشوائيا إلي ٧ معاملات تكونت من ثلاث خلطات كالتالى:

١- ٣٠% مريمية + ٢٠% شمر +٥٠% حصى لبان (خلطة ١)

٢- ٥٠% مريمية + ٣٠% شمر +٢٠% حصى لبان (خلطة ٢)

٣- ٢٠% مريمية + ٥٠% شمر +٣٠% حصى لبان (خلطة ٣)

تم إضافة كل مخلوط بمستويين إلى علائق دجاج اللحم (٠،٢٥% أو ٠،٥٠%) بالإضافة إلى عليقة الكنترول (بدون اضافات). اوضح التحليل الكيماوى (على أساس المادة الجافة) احتواء كل من بذور الشمر و أوراق المريمية على نسب بروتين خام أعلى من الموجود فى أوراق حصى لبان (١٥و ١١،٢و ٥،٥% على التوالى). احتوت بذور الشمر على نسبة أليف خام أقل من الموجود فى أوراق المريمية وحصى لبان ( ١٢،١و١٧،٩٠و ١٨،٩٠% على التوالى). كانت نسبة مستخلص الأثير فى أوراق حصى لبان وبذور الشمر أعلى منها فى أوراق المريمية (١٤،٩٩ و١٤،٢ و ٤% على التوالى). احتوت الزيوت الطيارة لهذه الأعشاب على المركبات الفعالة السائدة التالية سينيول و كامفور للمريمية و حصى لبان بينما أحتوى الشمر على أنيثول و فينشون. إضافة خلطة ١ بنسبة ٠،٢٥% و خلطة ٣ بنسبة ٠،٢٥ أو ٠،٥٠% حسنت كل من الزيادة في وزن الجسم و معامل التحويل الغذائي و ذلك بعد ٤ أسابيع من العمر. كما أدت هذه المعاملات أيضا إلى الحصول علي دليل أداء إنتاجي أفضل و أقل تكلفة غذاء / كجم زيادة في وزن الجسم خلال الفترة الكلية مقارنة بالكنترول. كانت أفضل النتائج خلال الفترة الكلية لمعامل التحويل الغذائي و دليل الأداء الإنتاجي و الأقل تكلفة غذاء / كجم زيادة في وزن الجسم هى في حالة إضافة خلطة ٣ بمستوي ٠،٥٠% من العليقة. وقد أدت إضافة خلطة ٣ بمستوى ٠،٢٥ أو ٠،٥٠% إلى تحسين معامل هضم البروتين. كما تحسنت نسب النبيحة معنويا مقارنة بالكنترول نتيجة إضافة خلطة ١ أو خلطة ٣ بمستوى ٠،٢٥%. و قد أدت كل الإضافات إلى خفض معنوي في كل من دهن البطن والعد البكتيري في لحم الدواجن و كذلك الدهون الكلية في بلازما الدم. أدت إضافة خلطة ٢ إلى خفض القبول العام للحم الدواجن في حين أن أعلى قيم كانت لخلطة ١ بمستوى ٠،٢٥% و خلطة ٣ بنسبة ٠،٢٥ أو ٠،٥٠%. لم يكن للخلطات المختبرة تأثيرا ضارا علي وظائف الكبد أو الكلى. في ضوء هذه الدراسة و لحين مزيد من التقييم يمكن التوصية بإضافة خلطة ١ بمستوي ٠,٢٥ أو خلطة ٣ بمستوي ٠,٢٥ أو ٠,٥% من العليقة كمنشط نمو طبيعى للحصول على أفضل أداء إنتاجي و جودة لحم و أقل تكلفة غذاء / كجم زيادة في الوزن.