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FFECT OF USING SOME MEDICINAL PLANTS AND THEIR MIXTURES ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF GIMMIZAH STRAIN

2- EGG PRODUCTION PERIOD.

By

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Abstract: *This investigation was designed to evaluate the feed additive potential of some medicinal plants as fenugreek, cinnamon, fennel and anise on production and productive performance of Gimmizah chickens. One hundred and forty four Gimmizah laying hens and 36 cocks (29 wks of age) were weighed and randomly housed in individual cages and allotted for nine dietary treatment groups. Chickens in 1, 2, 3 and 4 treatment groups were fed basal diet supplemented with 1g fenugreek, cinnamon, fennel or anise /kg diet, respectively. While, chickens in treatments 5, 6, 7 and 8 were fed basal diet supplemented with 0.5, 1.0, 1.5 or 2.0 g of equal mixture from the previous medicinal plants / kg diet, respectively. The last treatment (T9) was fed basal diet and used as control. Diets and water were provided ad-libtum throughout the experimental period (29-48 weeks of age).*

The overall mean results indicated that egg weight, egg production and egg mass for the layers fed basal diet supplemented with individual medicinal plants or their mixtures were significantly increased than those for control. Overall means of feed intake for dietary treatments were not significantly influenced by any supplementation treatments, whereas overall means of feed conversion ratios were significantly improved for all treatment groups compared to control.

Digestibility coefficient values of crude protein and ether extract significantly improved for chickens fed basal diet supplemented with individual medicinal plants (fenugreek, cinnamon, fennel and anise) or their mixtures than those fed control diet. Eggs for layers fed diets supplemented with fennel (1.0g/kg diet) or those for the highest level of mixture (2g/kg diet) had the highest numerical egg shell thickness (0.40 mm) compared with those for other treatment groups. Plasma total cholesterol and total lipids for layer groups fed basal diet supplemented with all mixture levels were significantly decreased compared with those supplemented with individual medicinal plants or control diet. Moreover, supplementation layer diets with mixtures of medicinal plants at different levels significantly improved both of fertility and total hatchability percentages of total eggs compared with those for other supplementations or control. Layers fed the highest mixture levels (1.5 and 2.0 g/kg diet) recorded significantly the highest hatchling weights (44.0 and 46.11 g, respectively).

In conclusion: Supplementation basal layer diet with medicinal plants (fenugreek, cinnamon, fennel and anise) or their mixtures significantly improved productive and reproductive performances of Gimmizah chickens and decreased plasma total cholesterol and total lipids. The best economical and relative economical efficiencies were recorded for the layers fed basal diet supplemented with fenugreek at level of 1 g /Kg.

Key words: fenugreek, cinnamon, fennel, anise, layer performance.

INTRODUCTION

Recently, it has been found that natural additives such as herbs and edible plants have some properties as growth enhancers to replace synthetic drugs. These additives are given to animals or birds to improve their physiological and productive performance under normal or stress conditions. Bans and restrictions on the use of animal antibiotic growth promoters stimulated interest in bioactive secondary metabolites of plant source as alternative performance enhancers *(Greathead, 2003).* The antimicrobial effect of the medicinal plants is well documented *(Valero and Salmeron, 2003).*

Fenugreek (*Trigonella foenum graecum L.*) has been recognized as a potential source of diosgenin a basic compound in the hemisynthesis of steroidal sapogenins such as cortisone and sex hormones *(Mazur et al., 1998). Rao et al. (2003)* found that seeds of fenugreek contained 4.8% saponins and considered as an appetizer and helps in digestion through enhancing the activity of pancreatic lipase and amylase. Using fenugreek was reported to improve the productive performance, health and immunity in poultry *(El-Ghamry et al., 2002 and Abaza, 2007).* Also, induced hypo-cholesterolemia, hypo-tipemia and hypoglycemia in poultry *(El-Ghamry et al., 2002).*

Cinnamon (Cinnamomum cassia) candies and gums have minimum inhibitory concentrations ranging from 25-100 mg/ml *(Quale et al., 1996).* Essential oils of cinnamon were found to possess antimicrobial properties in-vitro and shown to inhibit the growth of *B.cereus* (*Valero and Salmeron, 2003).* Toxigenic fungi are sensitive to cinnamon *(Soliman and Badea, 2002). Hassan et al. (2004)* observed that cinnamon supplementation had no significant effect on feed intake, while, feed conversion ratio was significantly improved. Also, albumin content, serum total lipids and cholesterol were significantly decreased by cinnamon supplementation.

Fennel (*Foeniculum vulgare*): The daily use of fennel revealed strong antioxidant activity of their extracts *(Satyanarayana et al., 2004).* Fennel enhanced the activity of pancreatic lipase and amylase *(Rao et al., 2003).* Adding fennel to the control diet improved productive performances for broiler *(Tollba and Hassan, 2003)*, for ducks *(Ghazalah and Ibrahim, 1996)* and for Japanese quail *(Abd El-Latif et al., 2002). Abd El-Latif et al. (2002)* stated that adding fennel to Japanese quail diets enhanced ($P < 0.05$) plasma total protein as well as albumin and globulin at 6 wks of age.

Anise (*Pimpinella anisum*) has been used as a traditional aromatic herb in many drinks and baked foods. Hot water extracts of the seeds have been used also in folk medicine *(Kosalec et al., 2005).* Studies with isolated anethole from star anise indicated that it is effective against microbial contamination *(Lee, 2005).*

The following study was conducted to investigate the effect of using fenugreek, cinnamon, fennel and anise powder as individual medicinal plants and/or their mixtures on productive and reproductive performances of Gimmizah chickens.

MATERIALS AND METHODS

This study was carried out at El-Sabahia Poultry Research Station, Animal Production Research Institute, Agriculture Research Center. One hundred and forty four Gimmizah laying hens and 36 cocks (29 wks of age) were individually weighed and randomly housed in individual cages and allotted for nine dietary treatments groups of

16 hens and 4 cocks each. The birds were maintained under commonly 15 h light : 9 h dark cycle throughout the experimental period. Feed and water were offered *ad-libtum* throughout the experimental periods (29- 32, 33-36, 37-40, 41-44 and 45-48 weeks of age). Chickens for each treatment were fed basal diet (Corn-Soybean diet, Table 1) supplemented with different additives as following:-

T1: Basal diet + fenugreek powder (1 g/kg), Feng (1 g/kg).
T2:-Basal diet + cinnamon powder (1 g/kg), Cin. (1 g/kg).
T3: Basal diet + fennel powder (1 g/kg), Fen (1 g/kg).
T4: Basal diet + anise powder (1 g/kg), Ani. (1 g/kg).
T5: Basal diet + equal mixture of the previous additives at 0.5 g/kgdiet.
T6: Basal diet + equal mixture of the previous additives at 1.0 g/kg diet.
T7: Basal diet + equal mixture of the previous additives at 1.5 g/kgdiet.
T8: Basal diet + equal mixture of the previous additives at 2.0 g/kg diet.
T9: Basal diet, Basal diet without any supplementation (control),

Productive and Reproductive Traits:

Egg weight (EW), egg mass (EM), egg production (EP), feed intake (FI) and feed conversion ratio (FCR) were recorded and calculated at the end of each 4-week interval throughout the whole experimental period. External and internal egg quality measurements were measured at the 32nd and 48th weeks of age using the eggs produced during three successive days per treatment. Eggs were weighed individually then broken and the inner contents were placed on a leveled glass surface to determine the inner egg quality. Egg yolk and albumen were separated and weighed on a fresh matter basis. The thick albumen and yolk heights were measured to the nearest mm. with a tripod micrometer, yolk diameter was also recorded to the nearest mm. with a caliper. The shells were washed under slightly flowing water to removing albumen remains also, inner egg shell membrane were separated then air-dried for three days then weighted to nearest mg. Finally, samples taken from sharp, blunt and equatorial parts were measured and the average shell thickness (mm) was obtained from the average values of these three parts *(Tyler, 1961)*. At the end of experiment (48 wk of age), hatching eggs laid during the last three successive weeks were incubated and replicated three times to determine the fertility and hatchability percentages. Also, chick weights at hatch were recorded.

Nutrients digestibility:

At the end of the experimental period digestion trial was designed to estimate the digestion coefficients of different nutrients on a dry matter basis. Three cockerels from each treatment were housed in individual cages, which enabled a complete separation and collection of excreta. Cockerels were starved to about 24 hours before starting the digestion trial. Experimental diets were offered *ad-libitum* through the first two days of the experiment and the amount of feed consumption was recorded. The excreta, which fall on polyethelne sheets during second and third days were collected quantitatively every 24 hours. Feathers and scattered feed were taken out of the excreta. The excreta for the three cockerels were pooled together and dried at 60°C till constant weight. Then, they were weighed, grounded, well mixed and stored in screw-topglass jars for analyses. The procedure described by *Jakobsen et al. (1960)* was used for determination fecal protein from excreta samples. Diets and excreta were analyzed for moisture, dry matter (DM), crude protein (CP), either extract (EE), crude fiber (CF), ash, and nitrogen free extract (NFE) according to *A.O.A.C. (1990)*. Digestion coefficients of DM, CP, CF, EE and NFE were calculated *according to (Fraps ,1946).*

Biochemical Parameters:

Plasma samples were assigned for determination of total protein *(Peters, 1968)*, total cholesterol *(Ellefson and Caraway, 1976)*, total lipids *(Bucolo and David, 1973)*, ALT and AST transaminase enzymes activities *(Reitman and Frankel, 1957)*. Procedures were similar as described by available commercial kits (Bio-Diagonosis Co., Cairo, Egypt).

Economical Efficiency:

The total feed cost (L.E/hen) at the end of the experiment for each treatment was calculated depending on the local market prices of the ingredients used for formulating the experimental diet. Prices of fenugreek, cinnamon, fennel and anise were 5, 45, 25 and 25 LE /kg, respectively. Also, the total income (L.E/hen) was calculated depending on the market price of the hatching and table eggs (1.25 and 0.50 L.E, respectively). Economical efficiency (EE) and relative economic efficiency (REE) were calculated according to input-output analysis *(Heady and Jensen, 1954)*.

All results were statistically analyzed by General Linear Models (GLM), one way analysis of variance, using SAS software *(SAS Institute, 1999)*.

Differences among means were separated using Duncan's multiple range test *(Duncan, 1955)*.

RESULTS AND DISCUSSION

Productive Traits:

Data from Table 2 indicated that EW values during the first and second experimental periods (29-32 and 33-36 wks of age) were not significantly affected by individual medicinal plants supplementation or their mixtures. Whereas, during 37-40 wks of age, EW increased significantly ($P<0.05$) for groups fed mixture of medicinal plants (T5, T6, T7 and T8) as compared with those for other treatment groups. Also, it can be observed from this table that Gimmizah hens fed the highest dose of mixture (2g/kg diet, T8) produced the biggest EW through the later periods (41-44 and 45-48 wks of age) when compared with those for other treatments. However, the overall mean results indicated that EW for layers fed basal diet supplemented with individual medicinal plants or their mixtures were increased significantly than those fed basal diet (control). Similar results for fenugreek were obtained by *El-Kaiaty et al. (2002)*. Also, *Abaza (2007)* indicated that fenugreek supplementation increased egg numbers and egg mass than those fed control diet.

Results from Tables 3 and 4 showed a significant ($P<0.05$) increase of EP (egg/hen/day) and EM (g/hen/day) through all experimental periods. Also, there were significant increases of EM and EP overall means for hens fed basal diets supplemented with different experimental medicinal plants or their mixtures compared with those for control. Improvement of EP may be due to the mode of action of herbs or their mixtures in bird utilization of ingredients as reported by *Oktay et al. (2003)* and *Satyanarayana et al. (2004)*. Our results are in agreement with the results of *Murray et al. (1991)* who reported that a significant increase in egg production may be due to the presence of vitamins and fat soluble unidentified factors (a mixture of unsaturated fatty acids including linoleic, linolenic and arachidonic acids) in herbs mixture which have been determined as essential for egg production.

Supplementation layer diet with different medicinal plants or their mixtures at different levels has no significant effect on the amount of FI through all experimental periods and overall mean results (Table 5). Results regarding of fenugreek are compatible with the finding of *El-Kaiaty et al. (2002)* and *Moustafa (2006)* who indicated that there were no effects of supplemented fenugreek on feed consumption for laying hens and broilers.

Feed conversion ratios were significantly ($P<0.05$) improved for all hen groups fed the individual medicinal plants or their mixtures with all levels compared with those fed control diet through experimental periods 29-32, 33-36 and 37-40 wks of age, while these significant differences were not observed during the experimental periods 41-44 and 45-48 wks of age. Layer group (T8) fed the highest level of mixtures (2.0g/kg diet) realized the best FCR (3.3 g. /g. EM) during the last experimental periods (41-44 and 45-48 wks) compared with the other treatments groups. Moreover, overall means of FCR for all layer groups fed individual medicinal plants or their mixtures with all levels were significantly ($P< 0.5$) improved compared with those for control group (Table 6). Similar patterns were also observed by ***Mona and Amany (2005), Moustafa (2006)*** and ***Abaza (2007). El-Shayeb and Mabrouk (1984)*** reported that fenugreek can inhibit 85-90% of aflatoxins formation which leads to improving feed conversion ratio improvement.

The improvement in EP and FCR for layers fed diets containing individual medicinal plants or their mixtures in layer diets would suggest potential beneficial effects of these additives on gastrointestinal tract micro-organisms. ***Bhatti et al. (1996)*** revealed that fenugreek has antibacterial activity due to flavonoids content which improves the balance of the intestinal flora and metabolites. Moreover, herbs mixture improved the utilization of feed by increasing the activity of phosphates which act as transferring phosphate groups from one system to another in the form of an energy rich phosphate bond ***(Kalpana et al., 1996). Mazur et al. (1998)*** demonstrated that the presence of phytoestrogens in fenugreek may have a great value because of its antifungal and antioxidant activities. Also, the positive response of fenugreek on FCR may be due to the effective role of trigonelline content of the essential oil in fenugreek and it has anti carcinogenic, antiviral, antifungal and antioxidant activities. In the same connection, ***Zhao et al. (2003)*** found that trigonelline has a positive role on a middle rate of absorption and fast rate of elimination. Moreover, ***Oktay et al. (2003)*** indicated that the anise seed is a potential source of natural antioxidant, increasing digestive enzyme activities and decreasing harmful bacterial enzyme activity.

Digestibility Coefficient:

Results in Table 7 indicate that there were no significant differences on digestibility coefficient values of DM, OM, CF, EE and NFE. Generally, digestibility coefficient values of CP and EE significantly improved for layers fed basal diet supplemented with individual medicinal plants or their mixtures than those fed control diet. The improvement of digestibility coefficient values may be attributed to the potential beneficial effect of these additives or their mixtures on gastrointestinal tract micro-organisms and metabolites which be reflected on improving the digestibility of feed nutrients and the feed conversions. Similar results were confirmed by ***Bhatti et al. (1996)*** who revealed that fenugreek has antibacterial activity due to flavonoids content which improve the balance of the intestinal flora and metabolites. Also, ***Hodgson et al. (1998)*** reported that fennel oil has inhibitory properties to bacteria or yeast. ***Hernández et al. (2004)*** indicated that broiler finisher diet supplemented with avilamycin; 200 ppm essential oil extract from oregano, cinnamon, and pepper; and 5,000 ppm Labiatae extract from sage, thyme, and rosemary improved apparent fecal digestibility of DM and CP. ***Bravo et al. (2011)*** observed that a 100 mg/kg mixture of carvacrol, cinnamaldehyde, and capsicum oleoresin increased the dietary metabolizable energy of the corn-soybean meal diet.

Egg Quality:

Supplementation layer diet with different medicinal plants or their mixtures at different levels had no significant effect on egg shape index and shell, albumen and yolk percentages (Table 8). Results reported herein

concerning of the effect of fenugreek on yolk and albumen weights were not agreement with the finding of *El-Kaiaty et al. (2002)* who indicated that fenugreek had a significant increase in yolk and albumen weights.

Change of eggs shell thickness among different treatment groups had no definite trend. However, layers fed diets supplemented with fennel (1.0g/kg diet) or the highest level of mixtures (2g/kg diet) had numerical thicker egg shell (0.40 mm), while the lowest one (0.34 mm) was detected for control diet (T9). Results reported herein are in agreement with those reported by *Murray et al. (1991)* who suggested that the significant increase in internal egg quality may be due to the presence of a vitamin and fat soluble unidentified factors in herbs mixture. Also, *Bacha et al. (1997)* reported that anise is rich in mineral elements, which play an important role in increased egg shell intensities. Moreover, *Abaza (2007)* indicated that hens fed diet supplemented with fenugreek had numerically highest values of shell thickness (0.358 mm) and albumen weight percentage (49.65 %).

Biochemical Parameters:

Total cholesterol:

Layers fed basal diet supplemented with medicinal plants and their mixtures significantly ($P<0.05$) decreased total plasma cholesterol comparing with those fed control diet (Table 9). It is clear that total cholesterol for layers fed mixtures of medicinal plants with different levels (0.5 to 2.0 g/kg diet) were significantly decreased compared with those fed individual medicinal plants or control. Our results are in agreement with that reported by *El- Husseiny et al. (2002)* noticed that addition of fenugreek to broiler diet decreased significantly total cholesterol compared to control group. Also, *El-Kaiaty et al. (2002)* found that a fenugreek seeds extract containing steroid saponins induced hypocholesterolaemia. Such reduction is often related to the mode of action of fenugreek in bird metabolism, which includes competition with cholesterol at binding sites or interfere with the cholesterol biosynthesis in the liver. Hypocholesterolaemic effects of fenugreek are owing to increased conversion of hepatic cholesterol to bile salts due to loss in the feces of complexes of these substances with fenugreek fiber and saponins. Moreover, *Tollba and Hassan (2003)* reported that adding fennel grounds as natural feed additive to broiler diets under normal or high temperature conditions reduced ($P<0.05$) plasma cholesterol.

Total lipids:

Results in table 9 declared that supplementing layer diets with mixtures with different levels (0.5 to 2.0 g/kg diet) significantly decreased ($P<0.05$) the plasma total lipids compared with the other treatments groups. These results almost had the same trend of total cholesterol presented in this study. These results are in agreement with the results of *Gomez et al. (1998)* who indicated that total lipids decreased in rabbits fed on diets with fenugreek addition.

Total protein and albumin:

Supplementation layer diet with medicinal plants and their mixtures had insignificant effect on plasma total protein or albumin (Table 9). However, *Tollba and Hassan (2003)* reported that adding of fennel grounds as natural feed additive to broiler diets under normal or high temperature conditions improved total plasma protein as well as albumin and globulin, plasma glucose and plasma triiodothyronine (T_3). In the same trend, *Abd El-Latif et al. (2002)* stated that adding fennel to Japanese quail diets enhanced plasma total protein as well as albumin and globulin at 6 wks of age. On the other hand, *Gomez et al. (1998)* and *El-Kaiaty et al. (2002)* found that serum total protein decreased with fenugreek addition.

AST and ALT activation:

Supplementation layer diet with medicinal plants and their mixtures had insignificant effect on plasma AST and ALT

activation (Table 9). These results indicated that no adverse effects of medicinal plants and their mixtures on layers liver function. However, ***El- Husseiny et al. (2002)*** noticed that addition of fenugreek to broiler diet significantly increased AST and ALT values compared to control group.

Reproductive Traits:

Supplementation layer diets with medicinal plant mixtures at different levels significantly improved fertility and hatchability percentages of total eggs compared with other individual supplementations or control (Table 10). The highest mixture levels (1.5 and 2.0 g/kg diet), T8 recorded the best fertility and hatchability percentages of total eggs without significant differences with those fed 1g/kg mixtures (T6).

Layers fed the highest mixtures levels (1.5 and 2.0 g/kg diet) recorded the highest significant of hatched chick weights (44.0 and 46.11 g, respectively) compared with those fed the other supplementations or control diets (Table 10). These results are supported with results of ***Castellini et al. (2000).*** Also, ***Mona*** and ***Amany (2005)*** reported that fertility and hatchability percentages were significantly increased by increasing levels of FAP (medicinal plants mixture of fenugreek seeds, anise and pollen grains) supplementation. ***Bozkurt et al. (2009)*** showed that supplementing diets with EOM [including carvacrol, thymol, 1:8-cineole, *p*-cymene, and limonene] improved fertility, hatchability of total eggs set and the chick weight of broiler breeders.

Economical Efficiency:

Table 11 represented EE and REE of dietary treatments at the end of experiment (48 wks of age). The results indicated that EE and REE for layers fed basal diet supplemented with medicinal plants (fenugreek, cinnamon, fennel and anise) or their mixtures were surpassed EE and REE of layers fed control diet. The highest EE and REE (0.79 and 195.1, respectively) were recorded by layers fed basal diet supplemented with fenugreek (1 g/kg diet). This result could be attributed to surpassing the EP of layer group fed fenugreek (1 g/kg diet) compared with other treatments.

In conclusion: Supplementation basal layer diet with medicinal plants (fenugreek, cinnamon, fennel and anise) or their mixtures significantly improved productive and reproductive performances, decreased plasma total cholesterol and total lipids and improves economical and relative economical efficiencies of Gimmizah chickens.

Table1: Composition and the nutritive value of the experimental basal diet. **

Ingredients	(%)	Calculated analysis**	
Yellow corn	63.50	ME (Kcal/kg)	2703.34
Soyabean meal (44%)	24.57	Crude protein, %	16.00
Wheat bran	2.00	Crude fiber, %	3.47
Limestone	7.77	Crude fat, %	2.86
Premix*	0.30	Calcium, %	3.32
Table salt (NaCl)	0.30	Available phosphorus, %	0.406
Dicalcium phosphate	1.50	Lysine, %	0.889
DL-methionine	0.06	Methionine, %	0.350
Total	100.00	Methionine+Cystine, %	0.620
Price (L.E/ ton diet)	2467.0	Sodium, %	0.135

* Vitamins and minerals premix contain per 3kg Vit A 10 000 000 IU , Vit D_3 2000 000 IU,Vit E 10000mg,Vit K_3 1000mg, Vit B_1 1000mg, Vit B_2 5000mg, Vit $B_6$1500mg, Vit B_{12} 0mg, Pantothenic acid 10000mg, Niacin 30000mg, Biotin 50mg, Folic acid1000mg, Choline 250gm, Selenium 100mg, Copper 4000mg, Iron 30000mg, Manganess 60000mg, Zinc 50000mg,Iodine 1000mg, Cobalt 100mg and $CaCO_3$ to 3000g.

**According to feed composition tables for animal and poultry feedstuffs used in Egypt (2001).

Table (2): Effect of different medicinal plants supplementations on egg weight (g) of Gimmizah chickens through experimental periods.

Treatments	29-32 wks	33-36 wks	37-40 wks	41-44 wks	45-48 wks	Overall mean
T1,Feng[1](1g/kg)	45.9±0.65	53.9±0.87	55.2±0.52^{b}	55.1±0.41^{ab}	55.0±0.26^{b}	54.1±0.42^{a}
T2, Cin[2](1g/kg)	45.6±0.73	55.7±0.80	55.3±0.50^{b}	54.3±0.51^{ab}	55.1±0.27^{b}	53.7±0.37^{a}
T3,Fen[3](1g/kg)	47.0±0.45	54.7±0.91	56.1±0.31^{b}	55.6±0.57^{ab}	55.4±0.19^{b}	53.0±0.43^{a}
T4,Ani[4](1g/kg)	46.6±0.74	53.0±0.80	56.0±0.34^{b}	55.4±0.30^{ab}	56.3±0.24^{ab}	54.6±0.41^{a}
T5,Mix[5](0.5g/kg)	45.1±0.55	52.5±0.71	59.0±0.29^{a}	53.7±0.35^{b}	56.0±0.30^{ab}	54.5±0.42^{a}
T6,Mix(1g/kg)	44.5±0.42	54.0±0.75	58.1±0.27^{a}	53.2±0.39^{b}	55.3±0.25^{b}	54.3±0.39^{a}
T7,Mix(1.5g/kg)	46.0±0.40	53.5±0.78	58.4±0.26^{a}	55.3±0.27^{ab}	56.6±0.26^{ab}	55.0±0.40^{a}
T8,Mix(2g/kg)	46.4±0.55	54.0±0.88	60.0±0.30^{a}	58.7±0.36^{a}	60.1±0.20^{a}	56.7±0.38^{a}
T9,Basal Diet	45.1±0.50	52.0±0.66	56.2±0.45^{b}	55.1±0.41^{ab}	54.0±0.18^{b}	51.0±0.42^{b}

^{a,b,c}... Column means with different superscripts are differ significantly ($P < 0.05$).

1:- **Feng:** Fenugreek powder. 2:- **Cin** : Cinnamon powder. 3:- **Fen:** Fennel powder 4:- **Ani:** Anise powder. 5:- **Mix:** equal mixture of previous additives.

Table (3): Effect of different medicinal plants supplementations on egg production (egg/hen/day) of Gimmizah chickens through experimental periods.

Treatments	29-32 wks	33-36 wks	37-40 wks	41-44 wks	45-48 wks	Overall mean
T1,Feng[1](1g/kg)	0.61±0.20^{a}	0.64±0.25^{a}	0.66±0.23^{a}	0.63±0.21^{a}	0.64±0.20^{a}	0.65±0.19^{a}
T2, Cin[2](1g/kg)	0.56±0.15^{ab}	0.55±0.20^{b}	0.60±0.22^{ab}	0.57±0.17^{ab}	0.60±0.21^{a}	0.58±0.17^{ab}
T3,Fen[3](1g/kg)	0.57±0.13^{ab}	0.55±0.15^{b}	0.60±0.20^{ab}	0.59±0.18^{ab}	0.64±0.15^{a}	0.61±0.13^{a}
T4,Ani[4](1g/kg)	0.56±0.12^{ab}	0.57±0.16^{b}	0.67±0.15^{a}	0.60±0.20^{a}	0.58±0.10^{ab}	0.62±0.11^{a}
T5,Mix[5](0.5g/kg)	0.52±0.13^{b}	0.46±0.10^{c}	0.60±0.13^{ab}	0.59±0.17^{ab}	0.61±0.13^{a}	0.57±0.12^{ab}
T6,Mix(1g/kg)	0.53±0.11^{b}	0.45±0.12^{c}	0.62±0.14^{ab}	0.65±0.18^{a}	0.63±0.09^{a}	0.59±0.11^{ab}
T7,Mix(1.5g/kg)	0.59±0.12^{ab}	0.45±0.11^{c}	0.59±0.13^{ab}	0.60±0.19^{a}	0.63±0.11^{a}	0.58±0.10^{ab}
T8,Mix(2g/kg)	0.52±0.13^{b}	0.48±0.14^{c}	0.63±0.12^{ab}	0.65±0.16^{a}	0.64±0.17^{a}	0.60±0.13^{ab}
T9,Basal Diet	0.42±0.11^{d}	0.43±0.12^{d}	0.53±0.16^{c}	0.56±0.20^{b}	0.54±0.11^{b}	0.51±0.12^{c}

^{a,b,c}... Column means with different superscripts are differ significantly ($P < 0.05$).

1:- Feng: Fenugreek powder. 2:- Cin : Cinnamon powder. 3:- Fen: Fennel powder 4:- Ani: Anise powder. 5:- Mix: equal mixture of previous additives.

Table (4): Effect of different medicinal plants supplementations on egg mass (g/hen/day) of Gimmizah chickens through experimental periods.

Treatments	29-32 wks	33-36 wks	37-40 wks	41-44 wks	45-48 wks	Overall mean
T1,Feng[1](1g/kg)	28.9±1.2^{a}	35.1±2.0^{a}	37.2±1.9^{a}	36.7±1.5^{a}	36.2±1.6^{ab}	35.1±1.4^{a}
T2, Cin[2](1g/kg)	26.4±1.1^{ab}	31.5±1.8^{ab}	33.3±1.7^{b}	32.2±1.6^{b}	34.9±1.7^{b}	30.8±1.7^{b}
T3,Fen[3](1g/kg)	27.6±1.2^{a}	32.2±1.9^{ab}	35.6±1.5^{ab}	34.9±1.6^{ab}	36.5±1.9^{ab}	34.1±1.3^{a}
T4,Ani[4](1g/kg)	27.1±1.3^{a}	31.9±1.7^{ab}	38.4±1.3^{a}	35.4±1.4^{a}	33.9±1.4^{b}	33.8±1.6^{a}
T5,Mix[5](0.5g/kg)	25.0±1.3^{b}	26.2±1.8^{b}	37.1±1.2^{a}	33.7±1.3^{b}	35.6±1.3^{b}	31.7±1.4^{ab}
T6,Mix(1g/kg)	25.9±1.3^{ab}	26.1±1.6^{b}	38.2±1.4^{a}	36.2±1.4^{a}	36.0±1.5^{ab}	33.1±1.9^{a}
T7,Mix(1.5g/kg)	28.1±1.4^{a}	26.0±1.5^{b}	37.2±1.6^{a}	35.8±1.7^{a}	36.7±1.6^{ab}	33.7±1.4^{a}
T8,Mix(2g/kg)	23.7±1.2^{b}	27.0±1.9^{b}	39.7±1.7^{a}	39.5±1.8^{a}	39.5±1.8^{a}	34.6±1.3^{a}
T9,Basal Diet	22.6±0.5^{c}	22.7±1.7^{c}	31.8±1.4^{c}	30.9±1.5^{c}	29.3±1.9^{c}	27.9±1.4^{c}

^{a,b,c}... Column means with different superscripts are differ significantly ($P < 0.05$).

1:- Feng: Fenugreek powder. 2:- Cin : Cinnamon powder. 3:- Fen: Fennel powder 4:- Ani: Anise powder. 5:- Mix: equal mixture of previous additives.

Table (5): Effect of different medicinal plants supplementations on feed intake (g/hen/day) of Gimmizah chickens through experimental periods.

Treatments	29-32 wks	33-36 wks	37-40 wks	41-44 wks	45-48 wks	Overall mean
T1,Feng[1](1g/kg)	128.1±5.1	129.5±6.0	126.6±5.7	125.5±5.5	127.1±6.6	128.3±5.3
T2, Cin[2](1g/kg)	125.3±6.3	125.9±8.8	126.7±4.7	125.9±7.6	126.3±5.8	127.6±6.7
T3,Fen[3](1g/kg)	126.2±5.4	127.1±7.9	125.6±6.4	124.6±6.6	129.0±4.9	127.4±5.4
T4,Ani[4](1g/kg)	124.0±5.2	126.0±6.6	127.4±5.5	125.4±5.4	127.1±4.5	127.0±5.0
T5,Mix[5](0.5g/kg)	123.1±4.3	125.2±5.7	129.2±6.1	125.7±4.3	127.6±5.3	127.6±4.4
T6,Mix(1g/kg)	122.2±4.8	126.3±6.6	128.0±5.4	126.3±5.4	126.0±6.0	126.7±5.0
T7,Mix(1.5g/kg)	123.6±5.6	124.0±5.5	127.1.±5.6	125.8±4.7	127.1±5.6	126.5±5.4
T8,Mix(2g/kg)	120.3±7.3	126.1±4.9	128.6±4.7	127.4±4.9	129.0±4.7	125.9±5.2
T9,Basal Diet	127.7±5.5	124.9±4.8	128.8±5.4	127.0±6.5	128.7±4.9	128.6±1.4

1:- Feng: Fenugreek powder. 2:- Cin : Cinnamon powder. 3:- Fen: Fennel powder 4:- Ani: Anise powder. 5:- Mix: equal mixture of previous additives.

Table (6): Effect of different medicinal plants supplementations on feed conversion ratios (g. feed/ g. egg mass) of Gimmizah chickens through experimental periods.

Treatments	29-32 wks	33-36 wks	37-40 wks	41-44 wks	45-48 wks	Overall mean
T1,Feng[1](1g/kg)	4.6±0.51^{c}	4.1±0.45^{c}	3.6±0.25^{b}	3.7±0.34^{ab}	3.8±0.61^{ab}	3.7±0.41^{b}
T2, Cin[2](1g/kg)	4.8±0.91^{c}	4.0±0.61^{c}	3.8±0.32^{b}	4.1±0.37^{a}	3.8±0.70^{ab}	3.5±0.52^{b}
T3,Fen[3](1g/kg)	4.7±0.65^{c}	4.0±0.71^{c}	3.7±0.65^{b}	3.8±0.53^{a}	3.6±0.62^{ab}	3.6±0.51^{b}
T4,Ani[4](1g/kg)	4.6±0.51^{c}	4.0±0.62^{c}	3.5±0.66^{b}	3.6±0.33^{ab}	3.7±0.50^{ab}	3.7±0.49^{b}
T5,Mix[5](0.5g/kg)	5.0±0.81^{bc}	4.7±0.59^{b}	3.7±0.52^{b}	3.8±0.42^{a}	3.6±0.26^{ab}	3.9±0.60^{b}
T6,Mix(1g/kg)	4.8±0.72^{c}	4.8±0.49^{b}	3.8±0.56^{b}	3.7±0.51^{ab}	3.5±0.41^{b}	4.0±0.55^{b}
T7,Mix(1.5g/kg)	4.6±0.61^{c}	4.7±0.50^{b}	3.5±0.60^{b}	3.5±0.52^{b}	3.5±0.60^{b}	3.9±0.57^{b}
T8,Mix(2g/kg)	5.0±0.81^{bc}	4.8±0.61^{b}	3.4±0.52^{b}	3.3±0.53^{c}	3.3±0.71^{c}	3.8±0.70^{b}
T9,Basal Diet	5.7±0.63^{a}	5.5±0.51^{a}	4.2±0.49^{a}	4.1±0.61^{a}	4.4±0.80^{a}	4.6±0.66^{a}

^{a,b,c}... *Column means with different superscripts are differ significantly (P < 0.05).*

1:- Feng: Fenugreek powder. 2:- Cin : Cinnamon powder. 3:- Fen: Fennel powder 4:- Ani: Anise powder. 5:- Mix: equal mixture of previous additives.

Table (7): Effect of different medicinal plants supplementations on nutrients digestibility coefficient values of Gimmizah chickens.

Treatments	DM%	OM%	CP%	CF%	EE%	NFE
T1,Feng[1](1g/kg)	84.45±2.15	83.55±2.41	84.44±0.25^{ab}	21.84±2.2	73.14±1.95^{ab}	71.45±2.25
T2, Cin[2](1g/kg)	8301±2.29	8321±2.21	83.98±0.32^{ab}	21.71±2.^{4}	73.08±2.12^{ab}	71.28±1.32
T3,Fen[3](1g/kg)	83.62±4.16	82.54±2.16	83.27±0.65^{b}	22.22±2.4	73.25±2.15^{b}	70.25±2.21
T4,Ani[4](1g/kg)	83.95±2.15	82.54±3.51	83.25±0.66^{b}	23.01±2.1	73.44±1.06^{b}	71.45±1.66
T5,Mix[5](0.5g/kg)	8301±2.18	81.95±3.48	84.59±0.52^{ab}	23.01±1.8	74.01±2.15^{ab}	71.24±1.14
T6,Mix(1g/kg)	84.18±3.17	82.48±2.14	84.98±0.56^{ab}	23.21±2.7	74.02±2.15^{ab}	71.02±2.46
T7,Mix(1.5g/kg)	84.16±3.26	83.25±2.15	85.45±0.60^{ab}	22.22±2.6	74.21±1.50^{ab}	72.11±2.60
T8,Mix(2g/kg)	85.50±4.28	84.85±2.24	86.84±0.52^{a}	22.01±1.8	76.54±2.25^{a}	72.84±2.52
T9,Basal Diet	83.91±2.16	83.41±3.48	79.25±0.49^{c}	21.12±1.6	70.25±1.29^{c}	71.25±2.49

^{a,b,c}... Column means with different superscripts are differ significantly (P < 0.05).

1:- Feng: Fenugreek powder. 2:- Cin : Cinnamon powder. 3:- Fen: Fennel powder 4:- Ani: Anise powder. 5:- Mix: equal mixture of previous additives.

Table (8): Effect of different medicinal plants supplementations on egg quality traits of Gimmizah chickens.

Treatments	Egg shape index	Shell (%)	Albumen (%)	Yolk (%)	Shell thickness (mm)
T1,Feng[1](1g/kg)	72.5±2.2	14.2±0.40	53.1±0.71	32.7±0.30	0.38±0.02[ab]
T2, Cin[2](1g/kg)	76.2±2.1	13.3±0.41	53.8±0.82	32.9±0.26	0.37±0.01[ab]
T3,Fen[3](1g/kg)	76.8±1.8	14.0±0.39	50.9±0.69	35.1±0.29	0.40±0.01[a]
T4,Ani[4](1g/kg)	76.9±1.6	13.2±0.52	51.8±0.59	35.0±0.31	0.37±0.01[ab]
T5,Mix[5](0.5g/kg)	74.6±2.3	13.0±0.51	54.3±0.66	32.7±0.22	0.38±0.02[ab]
T6,Mix(1g/kg)	75.0±2.9	13.0±0.42	53.7±0.83	33.3±0.29	0.36±0.03[ab]
T7,Mix(1.5g/kg)	77.9±4.1	13.1±0.46	54.3±0.90	32.6±0.32	0.37±0.01[ab]
T8,Mix(2g/kg)	78.8±3.5	13.6±0.53	53.2±1.00	33.2±0.25	0.40±0.02[a]
T9,Basal Diet	75.03±2.9	13.1±0.41	52.2±0.97	34.7±0.40	0.34±0.02[b]

[a,b,c]... Column means with different superscripts are differ significantly ($P < 0.05$).

1:- Feng: Fenugreek powder. 2:- Cin : Cinnamon powder. 3:- Fen: Fennel powder 4:- Ani: Anise powder. 5:- Mix: equal mixture of previous additives.

Table (9): Effect of different medicinal plants supplementations on some biochemical parameters of Gimmizah chickens.

Treatments	Total Cholesterol (mg/dl)	Total lipids (mg/dL)	Total protein (g/dl)	Albumen (g/dL)	AST (U/l)	ALT (U/l)
T1,Feng[1](1g/kg)	160.3±3.0[c]	320.4±6.6[a]	3.90±0.09	3.80±0.36	115.9±0.70	18.9±0.01
T2, Cin[2](1g/kg)	162.3±5.1[c]	322.2±7.3[a]	3.65±0.08	3.78±0.25	118.2±0.65	19.1±0.02
T3,Fen[3](1g/kg)	169.5±6.2[b]	318.3±7.5[a]	3.72±0.07	3.84±0.15	116.3±0.71	17.2±0.01
T4,Ani[4](1g/kg)	160.2±5.3[c]	315.4±8.0[a]	3.81±0.06	3.90±0.23	117.4±0.74	18.5±0.01
T5,Mix[5](0.5g/kg)	152.9±6.9[d]	301.2±8.6[b]	3.93±0.10	3.93±0.26	118.0±0.67	17.4±0.02
T6,Mix(1g/kg)	150.1±5.8[d]	295.2±7.8[bc]	3.97±0.09	3.89±0.30	116.9±0.70	18.3±0.03
T7,Mix(1.5g/kg)	147.2±4.2[d]	290±3.7[bc]	3.89±0.05	3.91±0.29	119.3±0.80	19.0±0.02
T8,Mix(2g/kg)	146.3±5.7[d]	283±4.8[c]	3.94±0.08	3.90±0.31	120.7±0.91	19.6±0.04
T9,Basal Diet	175.9±6.0[a]	318±5.9[a]	3.85±0.11	3.70±0.28	114.8±0.87	17.9±0.03

[a,b,c]... Column means with different superscripts are differ significantly ($P < 0.05$).

1:- Feng: Fenugreek powder. 2:- Cin : Cinnamon powder. 3:- Fen: Fennel powder 4:- Ani: Anise powder. 5:- Mix: equal mixture of previous additives.

Table (10): Effect of different medicinal plants supplementations on fertility, hatchability percentages of total eggs and hatching chick weight.

Treatments	Fertility (%)	Hatchability (%)	hatching Chick weight (g)
T1,Feng[1](1g/kg)	75.11±1.90[c]	74.15±1.9[c]	41.30±1.1[c]
T2, Cin[2](1g/kg)	75.00±1.1[c]	74.90±1.8[c]	41.43±1.3[c]
T3,Fen[3](1g/kg)	75.12±0.3[c]	74.70±1.5[c]	41.96±0.9[c]
T4,Ani[4](1g/kg)	76.16±0.6[c]	76.01±1.0[c]	41.49±0.8[c]
T5,Mix[5](0.5g/kg)	80.67±1.9[b]	80.50±1.6[b]	40.68±0.4[c]
T6,Mix(1g/kg)	85.00±1.2[ab]	84.60±1.4[ab]	40.93±1.0[c]
T7,Mix(1.5g/kg)	87.01±1.4[a]	86.90±1.8[a]	44.00±0.6[ab]
T8,Mix(2g/kg)	90.15±1.9[a]	89.90±2.1[a]	46.11±0.6[a]
T9,Basal Diet	75.00±1.5[c]	75.00±2.0[c]	40.00±0.7[c]

[a,b,c]... Column means with different superscripts are differ significantly ($P < 0.05$).

1:- Feng: Fenugreek powder. 2:- Cin : Cinnamon powder. 3:- Fen: Fennel powder 4:- Ani: Anise powder. 5:- Mix: equal mixture of previous additives.

Table (11): Effect of different medicinal plants supplementations on economical efficiency of Gimmizah chickens.

Treatments	Feng[1] (1g/kg)	Cin[2] (1g/kg)	Fen[3] (1g/kg)	Ani[4] (1g/kg)	Mix[5] (0.5g/kg)	Mix (1g/kg)	Mix (1.5g/kg)	Mix (2g/kg)	Basal Diet
EP*	0.65	0.54	0.61	0.62	0.57	0.59	0.58	0.60	0.51
EP[A]	91.0	75.6	85.4	86.8	79.8	82.6	81.2	84.0	71.4
FI**	128.3	127.6	127.4	127.0	127.6	126.7	126.5	125.9	128.6
TFI[# B]	17.96	17.86	17.84	17.78	17.86	17.74	17.71	17.63	18.00
Egg Price[C]	79.63	66.15	74.73	75.95	69.83	72.28	71.05	73.50	62.48
FeedCost[D]	44.40	44.87	44.45	44.31	44.29	44.20	44.35	44.36	44.42
NetReturn[E]	35.22	21.28	30.28	31.64	25.52	28.07	26.70	29.14	18.06
EE[F]	0.79	0.47	0.68	0.71	0.58	0.64	0.60	0.66	0.41
REE[G] (%)	195.1	116.6	167.5	1758.6	141.7	156.2	148.0	161.5	100.0

1:-Feng:-Fenugreek powder (=5LE/Kg). 2:- Cin.:Cinnamon powder(=45LE/Kg).
3:- Fen:-Fennel powder (=25LE/Kg). 4:- Ani: Anise powder (=25 LE/Kg).
5:- Mix: equal mixture of previous additives (=LE/Kg).
* EP= Egg production (egg/hen/day) **FI= Feed Intake(g/hen/day).
# TFI = total feed intake(Kg/hen).
Table Egg price=0.50LE/ egg. Hatching egg price=1.25LE/ egg.
A:- EP(egg/hen) = EP(egg/hen/day) X 140 days (Experiment period, days).
B:- TFI (Kg/hen):= FI (g/hen/day)X 140 days (Experiment period, days).
Table Eggs (egg/hen) = A X 50% (assuming 50% while soled as Table eggs)
Hatching Eggs (egg/hen) = A X 50% (assuming 50% while soled as hatching eggs)
C:- Egg Price(LE) = Table Eggs (egg/hen) X 0.50 LE + Hatching Eggs(egg/hen) X 1.25 LE
D: : Feed cost = Basal diet cost + cost of supplemented medicinal plants or their mixtures.
E:Net return (LE) = Differences between Egg price and Feed cost.
F: Economic Efficiency(EE) = (net return / Feed cost)x100.
G:Relative economical efficiency (REE), assuming control treatment = 100 %.

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الملخص العربي

تـأثير استخدام بعض النباتات الطبية وخلطاتها على الأداء الأنتاجى والتناسلى لسلالة الجميزة

٢- فترةانتاج البيض

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صممت هذه الدراسة لتقيم القوة الكامنة لبعض النباتات الطبية مثل الحلبة و القرفة و الشمر و اليانسون ومخلوطهم كاضافة غذائية على الآداء الأنتاجى والتناسلى لدجاج الجميزة. تم وزن وتوزيع عدد ١٤٤ دجاجة و ٣٦ ديك من سلالة الجميزة عمر ٢٩ أسابيع عشوائيا الى ٩ معاملات غذائية فى اقفاص فردية . تم تغذية الدجاج فى المعاملات ١ و٢ و ٣ و ٤ على عليقة اساسية مضاف اليها ١.٠ جم من الحلبة أو القرفة أو الشمر أو اليانسون المطحون لكل كجم علف. بينما دجاج المعاملات ٥ و٦ و ٧ و٨ فقد غذيت على عليقة اساسية مضاف اليها ٠.٥ أو ١.٠ أو ١.٥ أو ٢.٠ جم من مخلوط متساوى من النباتات الطبية السابقة وذلك لكل كجم علف على التوالى واستخدمت المعاملة الأخيرة (معاملة ٩) كمجموعة مقارنة حيث غذيت على العليقة الأساسية بدون أى اضافات. تم تقديم العلف وانماء بصورة حرة خلال فترات الدراسة (٢٩ – ٤٨ اسبوع).

أوضحت نتائج المتوسط العام لوزن البيضة و انتاج البيض و كتلة البيض للدجاجات التى غذيت على عليقة اساسية أضيف اليها أحد النباتات الطبية (الحلبة و القرفة و الشمر و اليانسون) او مخلوطها زيادة معنوية مقارنة بنتائج الدجاجات التى غذيت على عليقة مقارنة. المتوسط العام للغذاء المأكول لمختلف المعاملات لم يتأثر معنويا باى من الأضافات ، بينما تحسنت معنويا الكفاءة التحويلية للعلف.

تحسنت معنويا معاملات الهضم للبروتين الخام و المستخلص الأيثيرى للدجاج الذى غذى على عليقة اساسية مضاف اليها أحد النباتات الطبية اومخلوطها وذلك مقارنة بالدجاجات التى غذيت على عليقة مقارنة. البيض الناتج من الدجاجات التى غذيت على عليقة اساسية مضاف اليها الشمر(١.٠ جم /كجم علف) اومضاف اليها المستوى الأعلى من مخلوط النباتات الطبية (٢.٠جم / كجم علف) كان له أكبرسمك قشرة (٠.٤٠ مم) مقارنة بالمعاملات الأخرى . أنخفض معنويا تركيز الكوليسترول الكلى و الدهون الكلية بالبلازما للدجاجات التى غذيت على عليقة اساسية مضاف اليها مختلف النسب من مخلوط النباتات الطبية مقارنة بالتى غذيت على عليقة اساسية مضاف اليها أحد النباتات الطبية اوغذيت على العليقة المقارنة. أضافة مخلوط النباتات الطبية بمختلف المستويات الى علائق دجاج الجميزة البياض حسن معنويا النسب المئوية للخصوبة والتفريخ الكلية مقارنة بالمعاملات الأخرى او بالمجموعة المقارنة. أنتجت الدجاجات التى غذيت على عليقة اساسية مضاف اليها النسب العالية من مخلوط النباتات الطبية (١.٥ و ٢.٠ جم / كجم علف) أكبروزن كتاكيت فاقسة (٤٤.٠٠ و ٤٦.١١ جم ، على التوالى).

الخلاصة:- علائق الدجاج البياض التى زودت بأحد النباتات الطبية (الحلبة ، القرفة ، الشمر ، اليانسون) أو مخلوطها تؤدى الى تحسن معنوى فى صفات الأداء الأنتاجى والتناسلى لدجاج الجميزة وتخفض تركيزالكوليسترول والدهون الكلية بالبلازما. تم تسجيل افضل كفائة اقتصادية وكفائة اقتصادية نسبية للدجاجات التى غذيت على عليقة اساسية مضاف اليها الحلبة بمعدل ١.٠جم / كجم علف.