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EFFECT OF DIETARY OREGANO SUPPLEMENTATION ON PRODUCTIVE PERFORMANCE AND SOME PHYSIOLOGICAL PARAMETERS OF INSHAS CHICKENS STRAIN.

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ABSTRACT: In this experiment, Robadiar (R) or Orego-Stim (OS) foreign commercial products were used as a source of oregano. A total number of 165 Inshas strain birds (150 hens and 15 cocks) 24-wks-old were used in this experiment up to 40 wks of age. All birds were individually weighed and randomly divided into 5 equal experimental groups (30 hens and 3 cocks of each) with three replicates (10 hens and 1 cock each) with almost similar initial average body weight. Replicates were randomly housed in floor pens. The first group was fed the basal diet without supplementation and served as control. The second and third groups were fed the basal diet supplemented with 0.2 and 0.4g Robadiar/kg diet, respectively as a first source of oregano. The fourth and fifth groups were fed the basal diet supplemented with 0.3 and 0.6g Orego-Stim/kg diet, respectively as a second source of oregano. The results obtained could be summarized as follows: hens fed diets supplemented with either R or OS as oregano recorded the best values of egg production percentage, egg mass and feed conversion ratio than the control group. Hens fed on 0.4g Robadiar/kg diet (T3) recorded the better feed conversion ratio compared with other treatments (except T2 group) or control groups. Improvement was found in yolk% in hens supplemented with T3 group compared with other treatments or control groups. Adding oregano at different levels and types to layer diets significantly ($P \leq 0.05$) increased relative oviduct, the highest values were recorded by T3 group. There were significantly ($P \leq 0.05$) decreased relative abdominal fat due to adding oregano to layer diets, the lowest value was recorded in the third group. Both total anaerobic and Escherichia coli (E. coli) counts of bacteria were significantly ($P \leq 0.05$) decreased, while lactobacillus count was significantly ($P \leq 0.05$) increased by different types of added oregano when compared to the control group. Birds of T3 group had recorded the lowest counts of both anaerobic and E. coli bacteria, and the highest count of lactobacillus compared to other treatments. Each of plasma total lipids, total cholesterol, Triglycerides, high density lipoproteins and low density lipoproteins concentrations were significantly ($P \leq 0.05$) decreased by all the dietary treatments compared to control group. While, concentrations of plasma proteins and plasma of aspartate amino transaminase and alanine transaminase activities were not affected.

Key Words :Oregano, Hens, Productive Performance, Egg Quality, Semen and Parameters.

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Semen ejaculate volume, sperm motility, live sperm%, sperm concentration, total sperm/ejaculate and total live sperm/ejaculate were significantly (P≤0.05) increased for oregano treated groups compared with the control group. While, abnormal sperm% was significantly (P≤0.05) decreased with 0.4g R/kg diet and 0.3 and 0.6g OS/kg diet treated compared with other groups. Fertility and hatchability percentages significantly (P≤ 0.05) higher in oregano groups compared to the control group. From the present study, it could be concluded that supplementing Inshas chickens diets with oregano especially, 0.4g Robadiar/kg diet (as a source of oregano) significantly improved the productive and reproductive performance, egg quality and some physiological parameters during laying period.

INTRODUCTION

Essential oils are complex mixtures of different organic molecules- terpenes, alcohols, esters, aldehydes, ketones and phenols (Fletcher et al., 2001). They are obtained by extraction, fermentation, and pressing, but steam distillation method is the most commonly used method for commercial production of essential oils. As plant material can be used flowers, buds, seeds, leaves, twigs, bark, herbs, wood, fruits and roots (Burt, 2004). Their mode of action is more indirect, rather based on a comprehensive approach that can support internal defense mechanisms of animals and can therefore be considered sustainable, long-term solution (Gwendolyn, et al., 2002). Essential oil from oregano (Origanum vulgare) contains mainly carvacrol (86.9 %), a lesser extent, y-terpinene, p-cymene and myrcene. The possible transfer of antioxidant components from oregano essential oil into the body by feeding hens could inhibit the chain reaction associated with lipid oxidation consumed and thus reduce the transmission of oxidation products in egg yolk (Florou-Paneri et al., 2006).

Oregano is an aromatic plant with a wide distribution throughout the mediterranean area and Asia (Vokou et al., 1993). The essential oil obtained from Origanum vulgare subsp. hirtum plant by a steam distillation process comprises more than 20 ingredients, most of which are phenolic antioxidants (Vekiari et al., 1993). Major components are carvacrol and thymol that constitute about 78 to 82% of the total oil (Adam et al., 1998). Carvacrol inhibits the growth of several bacteria strains, e.g. Escherichia coli and Bacillus cereus (Du et al., 2008). Its low toxicity together with its pleasant taste and smell suggests its use as a feed additive to prevent bacterial contamination (Ultee and Smid, 2001). In Pseudomonas aeruginosa it causes damages to the cell membrane of these bacteria and, unlike other terpenes, inhibits the proliferation of this germ (Cox and Markham, 2007).

It has been suggested that the essential oil derived from oregano possess in vitro antimicrobial (Lambert et al., 2001), antifungal (Thompson, 1989), insecticidal (Karpouhtsis et al., 1998) and antioxidant (Botsoglou et al., 2002) properties. These properties are mainly attributed to carvacrol and thymol. The activity of other constituents such as the two monoterpene hydrocarbons, Y-terpinene and p-cymene, that often constitute about 5 and 7% of the total oil, respectively (Adam et al., 1998). However, the oregano plants, apart from these volatile phenolic antioxidant compounds occurring in the essential oil (Adam et al., 1998), contain a variety of glycosidically bound volatile and non-volatile constituents that also exhibit biological activity after enzymatic or acid hydrolysis (Milos et al., 2000). Therefore, oregano plants might be more biologically active than their essential oil when incorporated in poultry diets.

Christaki et al. (2011) found that dietary oregano (10 or 20 g/kg) increased egg production, decreased daily feed intake and enhanced some egg quality traits compared with control group in laying Japanese quails. Radwan et al.

(2008) found that addition of 0.5% oregano to laying hens diets numerically increased egg weight, egg mass, body weight gain and egg production % and improved feed conversion ratio. Addition of 0.5 or 1.0 oregano to El-Salaam cocks diets increased semen ejaculate volume, sperm motility% and live sperm%, and decreased dead sperm% and abnormal sperm% compared to control group (Radwan et al., 2008). The present study was carried out to determine the effect of oregano on productive performance and some physiological parameters in Inshas chickens strain.

MATERIALS AND METHODS

This experiment was carried out at Inshas Poultry breeding Station, Animal Production Research Institute, Agricultural Research Center.

Chickens and experimental design:

A total number of 165 Inshas strain birds (150 hens and 15 cocks) 24-wks-old were used in this experiment up to 40 wks of age. All birds were individually weighed and randomly divided into 5 equal experimental groups (30 hens and 3 cocks of each) with three replicates (10 hens and 1 cock each) with almost similar initial average body weight. Replicates were randomly housed in floor pens (280 cm long x 220 cm wide). The first group was fed the basal diet without supplementation and served as control. The second and third groups were fed the basal diet supplemented with 0.2 and 0.4g Robadiar/kg diet, respectively as a first source of oregano. The fourth and fifth groups were fed the basal diet supplemented with 0.3 and 0.6g Orego-Stim/kg diet, respectively as a second source of oregano. Robadiar produced by ROPAPHARM INTERNATIONAL, NEWZELAND,while,Orego-Stim produced by MERIDEN-ANIMAL HEALTH LIMITED, UK. Both source of oregano contain (65 and 36g Carvacrol/kg, respectively).

Managements and feeding:

All birds were kept under the same managerial hygienic and environmental conditions. Birds were kept in a windowed house with light cycle regimen of 16 h light: 8 h darkness, throughout the experimental period (24-40 wks of age). Feed and water were provided for ad libitum consumption. Birds were fed layer diets according to NRC (1994). The composition and calculated analysis of the basal diet are shown in Table 1.

Measurements:-

Laying performance traits:

Body weights were recorded at the beginning (24 weeks of age) and the end of the experiment (40 weeks of age). Feed intake and feed conversion ratio, egg number and egg production percentage, egg weight and egg mass (number of eggs x egg weight) were recorded for each replicate at the end of each week from 24 up to 40 wks of age.

Egg quality parameters:

A total of 75 eggs (15 eggs from each treatment) were taken after 40 wks of age to determine the interior and exterior egg quality parameters. Eggs were weighed individually then broken and the inner contents were placed on a leveled glass surface to determine the inner egg quality. Shell weight % (SW), shell thickness, mm (ST) including shell membranes was measured using a micrometer at three locations on the egg (air cell, equator and sharp end), egg length, cm (EL), egg width, cm (EWd), shape index (SI) was estimated as the percentage of (EWd) to (EL), albumen weight % (AW), yolk weight % (YW), yolk height, mm (YH), yolk diameter, mm (YD) and yolk index (YI) was estimated as the percentage of (YH) to (YD).

Carcass traits:-

At the end of the experimental period (40 wks of age) three birds from each treatment were randomly chosen, weighed and slaughtered until complete

bleeding, feathers were removed. The birds were weighed after removing heads, legs and viscera to determine the percentage of carcass weight included wings and necks. The heart, liver, empty gizzard, as well as oviduct length (cm), ovary, oviduct and abdominal fat were separated, weighed and their relative weight to live body weight were calculated.

Microbiological analysis:-

Small intestine contents of the slaughtered birds were separately collected for each treatment under aseptic conditions to determine the total count of anaerobic bacteria and Escherichia coli (E.Coli) in their selective media as described by Collins et al., (1995) and lactobacilli bacteria count in their selective media as described by Kim and Goepfert (1971).

Blood biochemical analysis:-

At the end of experimental period, three hens of each treatment were randomly chosen, slaughtered, blood samples were collected from the Jugular vein during exsanguinations in heparinized test tubes. Each sample was centrifuged at 3000 rpm for 20 minutes. The separated plasma was stored in a deep freezer at -20°C until assayed for total protein (TP), albumin (Al), globulin (Gl), total lipids (TL), total cholesterol (Tch), high density lipoproteins (HDL), low density lipoproteins (LDL), Triglycerides (TG), aspartate amino transaminase (AST) and alanine transaminase (ALT) activity according to the manufacture recommendations of commercial kits.

Semen quality:

Semen samples were collected randomly from 15 cocks (3 cocks of each treatment) at 40 weeks of age using the massage method. Semen samples were examined for the following characteristics.

1-The ejaculate volume was determined to the nearest 0.01 ml. using 1.00 ml. tuberculin syringe.

2-Mass motility score (from 1 to 5 grades).

3-Percentage of live and abnormal sperm were determined after staining with iosine and nigrosine.

4-Sperm concentration was determined by using Thomes–Zeis haemocytometer.

5-Total sperm/ejaculate x 10^9 = (ejaculate volume x sperm concentration).

6-Total abnormal sperm/ejaculate x 10^9 = (sperm concentration x abnormal sperm% / 100).

7-Total live sperm/ejaculate x 10^9 = (sperm concentration x live sperm% / 100).

The previous characteristics were determined according to (Kalamah et al., 2000).

Fertility and hatchability:

500 eggs were incubated to calculated fertility at 40 weeks of age. Hatchability was calculated as a percentage of fertile eggs or of total eggs set.

Economical efficiency (EEF):

Economical efficiency of egg production was calculated from the input-output analysis which was calculated according to the price of the experimental diets and eggs produced. These values were calculated as the net revenue per unit of total cost.

Statistical analysis:

Data were subjected to one-way analysis of variance using SAS (2001). Differences among means were detected by using Duncan's multiple range test (Duncan, 1955). The percentage values were transferred to percentage angle using arcsine equation before subjected to statistical analysis, and then actual means are presented. The following model was used:

$Yij = G + Ti + eij.$

Where, Yij = observation for each dependent variable; G = General mean;

Ti = Treatment effects (i = 1,2... and 5); eij = Random error.

RESULTS AND DISCUSSION

Production performance:

Effect of dietary oregano as Robadiear (R) or Orego-Steem (OS) supplementation on production performance are summarized in Table 2. The data showed that there was insignificantly effect due to oregano addition to the diets on initial (24 wk of age) and final (40 wk of age) body weight of Inshas laying hens. Also, oregano supplementation had no significant effect on feed intake in Inshas laying hens. Hens fed oregano at 0.4g R/kg (T3) diet had the significantly ($P \leq 0.05$) best feed conversion ratio as compared with other treatments groups (except T2 group). While, control group occurred inferior with significantly differ than the other groups. Results show significant differences among the experimental groups in egg production percentage. Egg production percentage was significantly ($P \leq 0.05$) improved by feeding diets supplemented with oregano (R or OS) during the experimental period as compared to the control group. Hens fed T3 diet had significantly higher value than fed T4 diet, while had insignificantly higher Egg production percentage than those T2 and T5 groups during the experimental period. Egg weight was not affected by treatments. Egg mass was significantly improved by feeding diets supplemented with oregano (R or OS) during the experimental period as compared to the control group. Hens fed T3 diet had the significantly highest egg mass as compared to other groups (except T2 group). These results are partially in agreement with results of Radwan et al. (2008), who showed that the addition of 0.5% oregano to laying hens diets numerically increased egg weight, egg mass, body weight gain and egg production and improved feed conversion ratio. However, this effect increased significantly by increasing the level to 1.0% compared with control. The beneficial effect of oregano may be due to the phenolic compounds which considerably exhibit antimicrobial and antifungal activity (Arcila-Lozano et al., 2004 and Bozin et al., 2006). This activity may be due to thymol and carvacrol which are present in the essential oil of oregano (Basilico and Basilico, 1999). In addition, Ali et al. (2007) showed that the addition of thyme to hens diets numerically increased egg number and improved feed conversion ratio compared to hens fed control diet. Also, it has been reported that dietary feeding essential oil extracted from thyme improved the secretion of digestive enzymes (Jang et al., 2004). Phenolic compounds (thymol and carvacrol) presence in thyme may be act as enzyme inhibitors (Fahey et al., 1993). For example it was found that the pure components of essential oils inhibit hepatic 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CO A) reductase activity (Crowell, 1999) which is a key regulatory enzyme in cholesterol synthesis. On the other hand, Arpasoval et al. (2013a and b) suggest that the egg production, egg mass, and egg weight were not significantly influenced with oregano oil.

Egg quality traits:

No significant effect on both external egg quality (except shell thickness) and internal egg quality (except yolk heigh, yolk% and yolk index) was observed due to oregano addition to Inshas laying hen diets (Table 3). Improvements were found in shell thickness of hens supplemented with 0.2 and 0.4g R/kg diet (T2 and T3), yolk% of T3 group and yolk heigh in hens supplemented with basal diet (T1) and yolk index in hens supplemented with 0.3g OS/kg diet (T4). In this respect, Radwan et al. (2008) showed that the addition of 0.5-1.0% oregano to hen's diets numerically increased the percentage of egg shape index and shell weight and shell thickness. Also, Ali et al. (2007) found that addition of thyme increased insignificantly the percentage of egg shape index and shell weight and shell thickness compared to hens fed control diet. The addition of 0.5% oregano in

laying hens diets, insignificantly decreased albumen weight % with increased yolk weight %. While, addition of 1.0% thyme show significant effect. .Also, yolk index percentages were significantly higher for 0.5-1.0% oregano as compared with the control groups (Radwan et al., 2008). Also, Ali et al. (2007) showed that addition of thyme increased shell weight% and shell thickness compared to hens fed control diet. Since the thyme is known as antioxidant, the thyme may be improved the small environment in uterus (site of calcium deposition) and consequently increase shell weight and shell thickness. On the other hand, Arpasoval et al. (2013 a and b) suggest that all of qualitative parameters of egg yolk (egg yolk weight (g), egg yolk index were not significantly influenced with oregano oil.

Carcass traits and lymphoid organs:-

As shown in Table 4, adding oregano (R or OS) to Inshas laying hen diets had insignificant effect of oviduct length and relative ovary, liver, heart, gizzard and dressing weights, and had significantly ($P \leq 0.05$) effect relative oviduct and abdominal fat. Feed supplementation significantly ($P \leq 0.05$) increased relative oviduct weight, the highest values in this respect, were recorded by T3 group. There were significantly decreased in relative abdominal fat due to adding oregano to layer diets, the lowest value was recorded in T3 group. The results were supported by Radwan et al. (2008) who showed that the percentage of the dressing, liver, heart, gizzard and spleen were not significantly affected by the addition of oregano in laying hens diets. Hens fed 0.5% oregano increased spleen weight % in comparison to the control by 11.46%. While Ali et al. (2007) showed that the addition of thyme tended to decrease the liver weight % compared to control diet and this may be due to the effect of essential compounds presence in this additive on lipid metabolism.

Microbiological analyses:-

The obtained results indicate that both total anaerobic and Escherichia coli (E. coli) counts of bacteria were significantly ($P \leq 0.05$) decreased, while lactobacillus count was significantly ($P \leq 0.05$) increased by different types of added oregano when compared to the control group (Table 5). However, no significant differences were found between different types of oregano treatments. Generally, hens of T3 group had record the lowest counts of both anaerobic and E. coli bacteria, and the highest count of lactobacillus compared to other treatments and the control group. These results are in agreement with the results of Penalver et al. (2005) in their in vitro study that essential oil of oregano incredibly exerted antibacterial effect against E. coli. They also, suggested that this potent antibacterial activity can widely be attributed to the presence of two major active components of oregano essential oil that is, thymol and carvacrol. Carvacrol inhibits the growth of several bacteria strains, e.g. E. coli and Bacillus cereus (Du et al., 2008). Its low toxicity together with its pleasant taste and smell suggests its use as a feed additive to prevent bacterial contamination (Ultee and Smid, 2001). In Pseudomonas aeruginosa it causes damages to the cell membrane of these bacteria and, unlike other terpenes, inhibits the proliferation of this germ (Cox and Markham, 2007). The phenolic compounds carvacrol and thymol present in the essential oil from oregano has a good antioxidant capacity and also, antimicrobial activity against pathogenic microorganisms like Salmonella typhimurium, E. coli, Staphylococcus aureus and Staphylococcus epidermidis. (Arcila-Lozano et al., 2004).

Blood biochemical analysis:-

As shown in Table 6, adding oregano (R or OS) to laying hen diet's did not affect total plasma protein (TP), albumin (Al), globulin (Gl), and (Al/Gl)

and enzymes activities (aspartate amino transaminase (AST) and alanine transaminase (ALT) enzymes) concentrations compared to the control group. While, adding the oregano to laying hens diets decreased ($P<0.05$) plasma concentrations of total lipids (TL), total cholesterol (TCh), high density lipoproteins (HDL-ch), low density lipoproteins (LDL-ch) and Triglycerides (TG) fractions comparing to untreated control group. However, there were no significant differences between oregano types (R and OS) in this respect. These results are partially in agreement with the previous findings of Radwan et al. (2008) who showed that the addition of oregano in laying hens diets had no significant effect on blood constituents (AST, ALT, total protein, albumin, globulin, LDL-cholesterol and HDL-cholesterol), except total lipid and cholesterol which decreased significantly. It could be concluded that oregano had no adverse effects on liver functions (AST and ALT) or blood constituents. The decrease of total lipid and cholesterol may be due to the effect of essential oil compounds present in oregano on lipid metabolism. Also, Ali et al., (2007) found that addition of thyme to hen's diets significantly decreased plasma LDL, HDL, total cholesterol, triglyceride and total lipid. Radwan (2003) reported that the decrease of total lipid and cholesterol may be attributed to the lowering effect of thymol and carvacrol on HMG-COA that is needed for cholesterol synthesis in liver. Lee et al. (2003) found that dietary carvacrol significantly lowered plasma triglyceride and phospholipids by 12 and 7%, respectively and indicating that dietary carvacrol, but not thymol may have more impact on lipogenesis than on cholesterol biosynthesis. But, Case et al. (1995) found that feeding of thymol at a dietary concentration of 150 ppm to Leghorn chickens for 21 day reduced serum cholesterol by 9%. However, most of essential oil is known to be altering lipid metabolism. Previous studies have shown that hyperlipidemia increases the plasma levels of oxygen free radicals (Prasad and Kalra, 1993) and produce oxidized compounds such as malondialdehyde. It may be concluded that the decreasing plasma lipid by thyme may be the reason of increasing plasma antioxidant capacity of hens fed their diets (Ali et al., 2007).

Semen quality:

Results in Table 7 indicates that ejaculate volume, sperm motility, live sperm%, sperm concentration, total sperm/ejaculate and total live sperm/ejaculate were significantly ($P\leq0.05$) increased in oregano treated groups. While, abnormal sperm% was significantly ($P\leq0.05$) decreased with 0.4g R/kg diet and 0.3 and 0.6g OS/kg diet treated compared with other groups. These results are agree with those obtained by Radwan et al. (2008) who found that there were insignificant differences between oregano supplementation groups and control group on ejaculate volume, motility and the abnormal sperms. While there were significant differences in live and dead sperms%. The highest values were recorded with 1.0% oregano in diets. Abnormal sperm% was not influenced significantly ($P \leq0.05$) by addition of oregano. However, the addition 1.0% oregano decreased numerically abnormal sperm% and the lowest value at 1.0% oregano. Pappas et al. (2006) indicated that the phospholipids of avian spermatozoa are characterized by high proportions of arachidonic and docosatetraenoic fatty acid, which are very susceptible to oxidation.

Fertility and hatchability:

Significant effects of oregano treatment on fertility and hatchability percentages are shown in Table 8. Fertility percentages were significantly ($P\leq 0.05$) higher in oregano treated groups than the control group. An increase of fertile eggs in oregano treated groups could be due to significant increase of ejaculate volume, sperm motility, live sperm%, sperm

concentration, total sperm/ejaculate and total live sperm/ejaculate compared with those in the control group. Also, hatchability percentages (hatchability of total and fertile eggs) were significantly ($P \leq 0.05$) higher in oregano groups compared to the control group. Such increase may depend on egg shell thickness improvement in most treated groups compared with the control group. The highest values of both fertility and hatchability percentages were recorded by Robadyar groups (T2 and T3) compared with Orego-Steem groups (T4 and T5) and the differences in this respect, were not significant. These results is in accordance with those found by Radwan et al. (2008) who showed that the addition of 1% oregano to hens' diets significantly increased the percentages of fertility in comparison to hens fed control diets by 8.23. This improvement can be explained as a result of oregano which have antioxidant activities; decreased malondialdehyde formation in egg yolk and improved the semen characteristics consequently. The addition of 1% thyme to hens diets significantly increase the percentages of hatchability in comparison to hens fed control diets by 18.60% for fertile fresh eggs. The addition of thyme to hens diets significantly increased the percentages of fertility and hatchability of eggs compared to hens fed control diets. The improve in hatchability by thyme can be explain as a result of its effect on decreasing plasma total lipid and consequently decreased the lipid and oxidized compounds pass to egg (Ali et al., 2007). Botsoglou et al. (1997) showed that antioxidant constituents of thyme into the hen through feeding might inhibit the chain reaction involved in oxidation of the consumed lipids, thus decreasing the oxidation products transferred into the yolk. Also, the antioxidants in thyme may transfer to eggs. Thyme also increased antioxidant capacity and decreased LDL in plasma and consequently decreased the sources of free radical (Ali et al., 2007). Antioxidant compounds presence in thyme deposited into yolk (Krause and Ternes, 1999) and consequently increase the adaptation mechanism to deal with overproduction of free radicals and increased the hatchability.

Economical efficiency (EEF):

The effect of supplementing oregano with two types (R or OS) on EEF is shown in Table 9. From economic viewpoint, it is clear that all dietary oregano supplemented groups had better EEF values compared with control-untreated group. The improvement in EFF ranged between 3.332and 6.280%. However, the T3 treatment recorded the superiority value for net revenue and EEF, as it increased EEF by 6.280% as compared by control group because it recorded the highest egg production. The increase in EEF which was exhibited by the rest of the experimental treatments valued about 5.236, 4.363 and 3.332% for T2, T4 and T5 dietary treatments, respectively.

CONCLUSION

The results of the present study suggest that adding Robadiar as oregano at level of 0.4g/kg diet to Inshas chickens was efficient in improving the productive and reproductive performance traits, egg quality, semen quality and has beneficial effects on some physiological responses during laying period.

Table (1): The composition of the experimental basal diets.

Ingredients	Treatments				
	T1 **Basal**	**T2** **0.2g/kg Robadiar**	**T3** **0.4g/kg Robadiar**	**T4** **0.3g/kg Orego-Stim**	**T5** **0.6g/kg Orego-Stim**
	Percentage (%)				
Yellow corn	61.57	61.57	61.57	61.57	61.57
Soya bean meal 44%	17.00	17.00	17.00	17.00	17.00
Wheat bran	6.70	6.70	6.70	6.70	6.70
Corn gluten 60%	4.50	4.50	4.50	4.50	4.50
Di Ca P	1.39	1.39	1.39	1.39	1.39
Lime stone	8.16	8.16	8.16	8.16	8.16
Salt	0.37	0.37	0.37	0.37	0.37
*Premix	0.30	0.30	0.30	0.30	0.30
L Methionine	0.01	0.01	0.01	0.01	0.01
Total	100.00	100.00	100.00	100.00	100.00
Calculated values (%)					
Protein	16.5	16.5	16.5	16.5	16.5
Metabolizable energy (M.E.)	2699	2699	2699	2699	2699
Crude fiber (C. F.)	3.468	3.468	3.468	3.468	3.468
Ether extract	2.964	2.964	2.964	2.964	2.964
Calcium	3.399	3.399	3.399	3.399	3.399
Available Phosphorous	0.397	0.397	0.397	0.397	0.397
Total Phosphorous	0.610	0.610	0.610	0.610	0.610
Sodium	0.164	0.164	0.164	0.164	0.164
Lysine	0.730	0.730	0.730	0.730	0.730
Methionine	0.335	0.335	0.335	0.335	0.335
Methionine & cysteine	0.619	0.619	0.619	0.619	0.619
Robadiar	0.00	200	400	0.00	0.00
Orego-Stim	0.00	0.00	0.00	300	600
Price L.E	2.640	2.673	2.704	2.667	2.693

*premix added to the 1 kg of diet including Vit.A 10000 I.U; vit. D3 2000 I.U; vit. E 15 mg; vit. K3 1 µg; vit B1 1mg; vit. B2 5mg; vit. B12 10 µg; vit B6 1.5mg; Niacin 30mg; Pantothenic acid 10mg; folic acid 1mg; Biotin 50 mg; choline 300 mg; zinc 50mg; copper 4mg; iodine 0.3 mg; iron 30mg; selenium 0.1mg; manganese 60mg; cobalt 0.1mg and carrier CaCo3 up to 1kg.

Table (2): Effect of dietary oregano supplementation on the performance of Inshas laying hens during the experimental period.

Item	T1	T2	T3	T4	T5	SE
Initial body weight (g)	1292.88	1293.92	1288.50	1289.28	1290.53	19.753
Final body weight (g)	1341.41	1344.68	1352.99	1350.46	1350.86	21.174
Feed intake (g/hen/day)	101.40	102.95	103.61	102.44	103.18	1.454
Feed conversion (g feed/g egg)	3.764 [a]	3.614 [bc]	3.549 [c]	3.646 [b]	3.656 [b]	0.021
Egg production (%)	60.16 [c]	63.01 [ab]	64.36 [a]	62.37 [b]	63.20 [ab]	1.633
Egg weigh (g)	44.78	45.21	45.33	45.05	44.66	1.249
Egg mass (g)	3017.28[c]	3190.47 [ab]	3269.39[a]	3146.74[b]	3161.03[b]	100.931

a, b…. Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$) T1:Control T2:Robadiar (0.2g/kg) T3:Robadiar (0.4g/kg) T4:Orego-Stim (0.3g/kg) T5:Orego-Stim (0.6g/kg).

Table (3): Effect of dietary oregano supplementation on external and internal egg quality of Inshas laying hens at 40 weeks of ages.

Item	T1	T2	T3	T4	T5	SE
External egg quality						
Egg length (cm)	52.36	52.02	52.12	51.94	51.18	0.671
Egg width (cm)	41.38	41.22	41.08	41.30	39.86	0.552
Shell thickness (mm)	0.366[b]	0.378 [a]	0.379 [a]	0.372 [ab]	0.376 [ab]	0.004
Shell weight (%)	13.54	12.58	13.58	14.91	14.29	0.850
Egg shape index	77.60	76.34	78.91	79.51	77.89	1.078
Internal egg quality						
Albumen height (mm)	7.18	6.60	7.08	7.00	7.43	0.838
Albumen (%)	55.29	57.28	53.40	53.45	53.95	1.496
Yolk height (mm)	17.23 [a]	16.89 [ab]	17.12 [ab]	17.03 [ab]	15.77[b]	0.427
Yolk diameter	39.24	39.06	38.84	38.20	39.56	0.756
Yolk (%)	31.18[b]	30.14[b]	33.01 [a]	31.64[b]	31.76[b]	1.065
Yolk index	43.99 [a]	43.30 [ab]	44.15 [a]	44.62 [a]	39.90[b]	1.311

a, b…. Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$) T1:Control T2:Robadiar (0.2g/kg) T3:Robadiar (0.4g/kg) T4:Orego-Stim (0.3g/kg) T5:Orego-Stim (0.6g/kg)

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Table (4): Effect of dietary oregano supplementation on carcass traits and organs weight (% of body weight) of Inshas laying hens at 40 weeks of ages.

Item	T1	T2	T3	T4	T5	SE
Oviduct length (cm)	59.67	61.67	64.33	62.33	63.67	2.565
Ovary (%)	2.40	2.60	2.62	2.51	2.61	0.144
Oviduct (%)	2.62 ^{c}	2.87 ^{ab}	3.00 ^{a}	2.84 ^{b}	2.83 ^{b}	0.056
Liver (%)	2.15	2.39	2.25	2.60	2.14	0.186
Heart (%)	0.453	0.410	0.447	0.437	0.413	0.033
Gizzard (%)	1.80	1.86	1.88	1.82	1.83	0.076
Dressing (%)	68.59	69.99	71.13	69.83	71.05	1.699
Abdominal fat (%)	0.247 ^{a}	0.215 ^{b}	0.191 ^{c}	0.219 ^{b}	0.196 ^{c}	0.0473

a, b…. Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$) T1:Control T2:Robadiar (0.2g/kg) T3:Robadiar (0.4g/kg) T4:Orego-Stim (0.3g/kg) T5:Orego-Stim (0.6g/kg).

Table (5): Effect of dietary oregano supplementation on bacteria count of Inshas laying hens at 40 weeks of ages.

Item	T1	T2	T3	T4	T5	SE
Total anaerobic bacteria ($x 10^6$)	8.73 ^{a}	7.51 ^{b}	6.91 ^{b}	7.47 ^{b}	7.33 ^{b}	0.689
Lactobacilli ($x 10^6$)	3.18 ^{b}	4.63 ^{a}	5.02 ^{a}	4.79 ^{a}	4.86 ^{a}	0.466
Escherichia coli ($x 10^2$)	824.09 ^{a}	761.25 ^{b}	726.83 ^{b}	755.18 ^{b}	760.11 ^{b}	34.736

a, b…. Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$) T1:Control T2:Robadiar (0.2g/kg) T3:Robadiar (0.4g/kg) T4:Orego-Stim (0.3g/kg) T5:Orego-Stim (0.6g/kg).

Table (6): Effect of dietary oregano supplementation on blood plasma proteins, glucose, lipids and enzymes concentrations of Inshas laying hens at 40 weeks of ages.

Item	T1	T2	T3	T4	T5	SE
Plasma proteins:						
Total protein (g/dl)	5.72	5.88	6.11	5.87	5.91	0.475
Albumin (Al) (g/dl)	3.02	3.11	3.27	2.97	2.86	0.248
Globulin (Gl) (g/dl)	2.70	2.77	2.84	2.90	3.05	0.275
Al/Gl Ratio	1.11	1.12	1.15	1.02	0.93	0.031
Plasma lipids:						
Total lipids (mg/dl)	253.92 ^{a}	233.36 ^{b}	224.19 ^{b}	235.16 ^{b}	221.44 ^{b}	9.733
Total cholesterol (mg/dl)	141.06 ^{a}	124.16 ^{b}	121.21 ^{b}	119.77 ^{b}	116.93 ^{b}	7.967
Triglycerides (mg/dl)	167.45 ^{a}	148.16 ^{b}	144.46 ^{b}	146.83 ^{b}	143.96 ^{b}	10.264
HDL-ch (mg/dl)	61.69 ^{a}	51.17 ^{b}	51.11 ^{b}	50.60 ^{b}	50.19 ^{b}	2.711
LDL-ch (mg/dl)	80.18 ^{a}	69.31 ^{b}	69.96 ^{b}	69.11 ^{b}	64.93 ^{b}	4.067
Enzymes activities:						
AST (IU/L)	40.16	40.25	39.18	39.09	40.22	6.213
ALT (IU/L)	27.76	25.11	26.65	29.14	29.37	6.541

a, b…. Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$)
T1:Control T2:Robadiar (0.2g/kg) T3:Robadiar (0.4g/kg) T4:Orego-Stim (0.3g/kg) T5:Orego-Stim (0.6g/kg).

Table (7): Effect of dietary oregano supplementation on semen quality traits of Inshas cocks at 40 weeks of ages.

Item	T1	T2	T3	T4	T5	SE
Ejaculate volume (ml)	0.29^{c}	0.39 ^{ab}	0.47 ^{a}	0.41 ^{ab}	0.38 ^{b}	0.028
Semen pH	7.50	7.66	7.59	7.60	7.40	0.165
Sperm motility (1-5)	2.50 ^{b}	3.60 ^{a}	3.70 ^{a}	3.90 ^{a}	3.90 ^{a}	0.316
Live sperm %	75.00 ^{b}	87.00 ^{a}	88.70^{a}	88.40 ^{a}	89.50 ^{a}	2.250
Abnormal sperm %	17.70 ^{a}	16.30 ^{ab}	12.80^{c}	13.80 ^{bc}	14.40 ^{bc}	1.043
Sperm concentration	2.96 ^{b}	3.38 ^{a}	3.74 ^{a}	3.75 ^{a}	3.59 ^{a}	0.170
Total sperm/ejaculate	0.84 ^{c}	1.34 ^{b}	1.74 ^{a}	1.64 ^{ab}	1.36 ^{b}	0.125
Total live sperm/ejaculate	2.26 ^{b}	2.99 ^{a}	3.31 ^{a}	3.33 ^{a}	3.22 ^{a}	0.194
Total abnormal sperm/ejaculate	0.51	0.54	0.48	0.51	0.51	0.035

a, b…. Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$)
T1:Control T2:Robadiar (0.2g/kg) T3:Robadiar (0.4g/kg) T4:Orego-Stim (0.3g/kg) T5:Orego-Stim (0.6g/kg).

Table (8): Effect of dietary oregano supplementation on fertility and hatchability percentages of Inshas laying hens at 40 weeks of ages.

Item	T1	T2	T3	T4	T5	SE
Fertility (%)	89.76 [b]	93.11 [a]	93.76 [a]	92.97 [a]	93.84 [a]	1.632
Hatchability of all eggs (%)	79.54 [b]	84.23 [a]	85.55 [a]	83.76 [a]	84.00 [a]	1.533
Hatchability of fertile eggs (%)	88.62 [b]	92.08 [a]	94.62 [a]	93.08 [a]	93.87 [a]	1.691

a, b…. Means within each row have no similar letter(s) are significantly different ($P \leq 0.05$)
T1:Control T2:Robadiar (0.2g/kg) T3:Robadiar (0.4g/kg) T4:Orego-Stim (0.3g/kg) T5:Orego-Stim (0.6g/kg).

Table (9): Effect of experimental treatments on the economic efficiency (EEF) of egg production.

Items	Treatment				
	T1	T2	T3	T4	T5
Total feed intake kg	11.357	11.530	11.604	11.473	11.556
Price of kg feed (L.E)	2.640	2.673	2.704	2.667	2.693
Total feed cost (L.E)	29.982	30.820	31.377	30.598	31.120
Total egg number/hen	67.38	70.57	72.13	69.85	70.78
Price of total egg production (L.E)	47.166	49.399	50.491	48.895	49.546
Net revenue /one hen (L.E)	17.184	18.579	19.114	18.297	18.426
Economic efficiency (EEF)*	0.573	0.603	0.609	0.598	0.592
Relative economic efficiency	100.00	105.236	106.280	104.363	103.332

T1:Control T2:Robadiar (0.2g/kg) T3:Robadiar (0.4g/kg) T4:Orego-Stim (0.3g/kg) T5:Orego-Stim (0.6g/kg).

1-According to the price of different ingredients available in ARE.

2-According to the price at the experimental time (2015).

3- Net revenue/ one laying hen (L.E)=price of total egg production/one laying hen (L.E)-total feed cost.

4-Economic efficiency=Net revenue/ one laying hen /total feed cost/ one laying hen.

5-Relative economic efficiency assuming that the relative EEF of the control group equal 100.

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الملخص العربى

تأثير اضافة الأورجانو فى العليقة على الآداء الانتاجى وبعض الصفات الفسيولوجية لدجاج سلالة انشاص خلال مرحلة الانتاج

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***قسم بحوث تربية الدواجن و ** قسم بحوث تغذية الدواجن**

معهد بحوث الانتاج الحيوانى – مركز البحوث الزراعية – الدقى - الجيزة

أجريت هذه الدراسة فى محطة بحوث تربية الدواجن بانشاص– معهد بحوث الانتاج الحيوانى وذلك بهدف دراسة تأثير إضافة كل من الروبادیار و الأوريجوستيم (منتجان أجنبيان) كمصدرين من الأورجانو إلى العليقة على كل من الأداء الانتاجى والفسيولوجى فى دجاج سلالة أنشاص (سلالة مصرية مستنبطة) خلال فترة الانتاج (من عمر ٢٤ حتى عمر ٤٠ أسبوع). واستخدم فى هذه الدراسة عدد ١٦٥طائر (١٥٠ انثى + ١٥ ذكر) وقسمت عشوائيا الى خمس مجموعات متساوية العدد (٣٠ انثى +٣ ذكور/ مجموعة) وكل مجموعة تم تقسيمها الى ثلاث مكررات متساوية العدد (١٠ اناث +١ ذكر /مكررة) وتم تغذية المجموعات الخمس كالتالى:

١- المجموعة الأولى:- تم تغذيتها على العليقة الأساسية (مقارنة) بدون أى اضافات.

٢- المجموعة الثانية :- تم تغذيتها على العليقة الأساسية مضاف اليها الروبادیار بمعدل ٢و٠جم/كجم علف.

٣- المجموعة الثالثة:- تم تغذيتها على العليقة الأساسية مضاف اليها الروبادیار بمعدل٤و٠جم/كجم علف.

٤- المجموعة الرابعة:- تم تغذيتها على العليقة الأساسية مضاف اليها الأوريجوستيم بمعدل ٣و٠جم/كجم علف.

٥- المجموعة الخامسة:- تم تغذيتها على العليقة الأساسية مضاف اليها الأوريجوستيم بمعدل ٦و٠جم/كجم علف.

وتتلخص أهم النتائج المتحصل عليها فيما يلى:

-سجلت إناث المجموعات المغذاه على العليقة الأساسية مضاف اليها أى من الروبادیار أو الأوريجوستيم أفضل النتائج فى كلا من النسبة المئوية لإنتاج البيض، كتلة البيض و معامل التحويل الغذائى لإنتاج البيض وذلك مقارنة بإناث مجموعة المقارنة.

-سجلت إناث المجموعة الثالثة تحسن فى معامل التحويل الغذائى وكذلك تحسن فى النسبة المئوية للصفار مقارنة بالمجاميع التجريبية الأخرى أو مجموعة المقارنة.

-وجد أن اضافة الأورجانو (الروبادیار أو الأوريجوستيم) إلى علائق الدجاج البياض أدى الى زيادة معنوية فى الوزن النسبى لقناة البيض وقد سجلت إناث المجموعة الثالثة أفضل النتائج فى هذا الصدد.

-وجد أن هناك إنخفاضا معنويا فى الوزن النسبى لدهن البطن نتيجة لإضافة الأورجانو (الروبادیار أو الأوريجوستيم) إلى علائق الدجاج مقارنة بإناث مجموعة المقارنة.

- إنخفض العدد الكلى للميكروبات الضارة (البكتيريا اللاهوائية والإى كولاى) انخفاضا معنويا بينما ارتفع العدد الكلى للميكروبات النافعة (بكتيريا اللكتوباسلاس) ارتفاعا معنويا فى الأعورين نتيجة التغذية على كل من الروبادیار (المجموعتين الثانية والثالثة) أو الأوريجوستيم (المجموعتين الرابعة والخامسة) مقارنة بمجموعة المقارنة وقد سجلت إناث المجموعة الثالثة أفضل النتائج فى ذلك مقارنة بإناث المجاميع التجريبية الأخرى أو إناث مجموعة المقارنة.

- وجد أن إضافة الأورجانو (الروبادیار أو الأوريجوستيم) إلى علائق الدجاج البياض أدى الى انخفاض تركيز الدهون فى بلازما الدم وذلك مقارنة بمجموعة المقارنة ، بينما لم تتأثر أى من بروتينات البلازما وإنزيمات الكبد بهذه الاضافات.

-وجد أن هناك زيادة معنوية فى حجم القذفة ، حركة الحيوانات المنوية، النسبة المئوية للحيوانات المنوية الحية، تركيز الحيوانات المنوية، العدد الكلى للحيوانات المنوية فى القذفة الواحدة، وكذلك العدد الكلى للحيوانات المنوية الحية فى القذفة الواحدة، بينما وجد أن هناك إنخفاضا معنويا فى النسبة المئوية للحيوانات المنوية الشاذة نتيجة التغذية على كل من الروبادیار (المجموعة الثالثة) أو الأوريجوستيم (المجموعتين الرابعة والخامسة) مقارنة بمجموعة المقارنة أو المجموعة الثانية.

-إرتفعت معنويا النسبة المئوية لكلا من الخصوبة والفقس نتيجة إضافة الأورجانو إلى علائق الدجاج البياض وذلك مقارنة بمجموعة المقارنة.

يتضح من هذه النتائج أن اضافة الروبادیار بمعدل ٤و٠جم/كجم علف كأحد مصادر الأورجانو إلى عليقة دجاج سلالة أنشاص خلال فترة الانتاج (من عمر ٢٤ حتى عمر٤٠ أسبوع) أدى الى تحسين الأداء الانتاجى والتناسلى وصفات جودة البيض وأظهر تأثيرا ايجابيا على بعض الصفات الفسيولوجية فى دجاج سلالة أنشاص البياض.