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EFFECT OF VITAMIN E AND PHYTOGENIC FEED ADDITIVES ON PERFOMANCE, BLOOD CONSTITUENTS AND ANTIOXIDATIVE PROPERTIES OF BROILER CHICKS.

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ABSTRACT: Two hundred and sixteen, 7 day old unsexed Hubbard broiler chicks were divided randomly into nine treatments. Each treatment had 3 replicates with 8 chicks each. Chicks of each replicate were housed in cages (100X50X50 cm). All chicks received basal diets had 22.5 and 17.54% crude protein and 3102 and 3099 kcal ME /kg diet for the starter and grower diet, respectively. Chicks in group 1 were fed on basal diets without any addition (control); chicks in other groups fed basal diets supplemented with V.E 200 mg/kg feed; Rosemary 1.5, 3 or 9 g/kg feed, Saffron15or 30 ppm/kg feed, Rosemary-Saffron (0.75g +7.5 ppm) / kg feed and Rosemary- Saffron (1.5g +15ppm)/kg feed for treatments 2, 3, 4, 5, 6, 7, 8 and 9, respectively.

Results of body weight and body weight gain at 42 day of age had a significantly ($P \leq 0.05$) decrease of broilers fed Rosemary 9.0 g/kg than other treatments. Feed consumption during 1- 6 week interval was significantly ($P \leq 0.05$) decrease for broilers fed Rosemary 9.0 g/kg, but Rosemary 9.0 g/kg feed had the worst conversion ration. No significant effects were observed in Carcass Characteristics and meat chemical analyses except abdominal fat.

Effect of vitamin E and phytogenic feed additives on Plasma Total Protein, globulin, γGT, glucose, Total cholesterol, HDL cholesterol, LDL cholesterol, triglyceride, TAC and MDA on boilers chicks at 6 weeks had a significant ($P \leq 0.05$) effects. On the other hand, no significant differences among the dietary treatments for plasma albumin were observed. So, these data indicate that, vitamin E and phytogenic feed additives exert a beneficial effects on performance, carcass meat quality and plasma blood constituents in broiler chicks.

Key words: Phytogenic, Vitamin E, Growth, Blood, Antioxidative Properties and Broiler.

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INTRODUCTION

In view of the ban on antibiotic growth promoters (AGP) world wide and the expected expansion of this, intensive research has been focused on the development of alternative strategies to maintain health and performance status in modern livestock production systems. Different substances, referred to as Natural Growth Promoters (NGP), have been identified as effective alternatives to AGP.
Recently, a large number of NGP are available on the market, including organic acids, immune-modulators, probiotics, prebiotics, enzymes and phytobiotics. All these products have the potential to beneficially affect growth performance by establishing and maintaining a well-balanced gut microflora which protects the host against pathogenic invasion. In some cases, however, scientific reports are inconsistent regarding the efficacy of NGP, whilst their mode of action remains, at least partly, undiscovered.

Phytobiotics originate from leaves, roots, tubers or fruits of herbs, spices or other plants. Rosemary (Rosmarinus officinalis) extracts are widely used in the food, nutraceutical and cosmetic areas. Rosemary extracts have a wide range of different radicals and toxic products of their metabolism phenolic compounds with biological activities **(Surai *et al.*, 2003)**. Moreover, rosemary has been demonstrated to have anticancer **(Tai *et al.*, 2012),** anti-inflammatory and antimicrobial effects **(Aruoma *et al.*, 1996; Seydim and Sarikus, 2006; Suong *et al.*, 2011).**

Saffron is a spice derived from the flower of the saffron crocus (*Crocus sativus*), a species of crocus in the Iridaceous. Saffron, long the world's most expensive spice by weight, **Katzer, (2001)** and **Lak, (1998).** Saffron (*Crocus sativus*) is a bulbous perennial of the iris family (Iridaceous) treasured for its golden-colored, pungent stigmas, which are dried and used to flavor and color foods as well as a dye.

Vitamin E (α-tocopherol), the powerful lipid-soluble antioxidant in biological membranes reacts readily with many radical and nonradical oxidants. In membranes, α-tocopherol has been proven to inhibit lipid peroxidation primarily by trapping peroxyl radicals, which propagate the radical chains **(Burton and Ingold, 1981 and 1986).**
The present experiment was conducted to study the impacts of different levels of rosemary leaves (RL) *(Rosmarinus officinals* L.), Saffron *Crocus sativus* (CS) and Vitamin E (α-tocopherol, L.) and their combinations as an alternative for a synthetic and antibiotics growth promoters on performance, carcass quality and blood constituents in broiler chicks.

MATERIALS AND METHODS

This study was carried out at the Poultry Research Station belonging to Faculty of Agriculture (Saba Basha), Alexandria University. Alexandria, Egypt.

1. Experimental birds:

Two hundred and sixteen, 7 day old unsexed Hubbard broiler chicks (average weight 215g) obtained from Cairo Poultry Company (CPC) were used in this experiment. Chicks were divided randomly into nine groups with twenty-four chicks in each group and each sub group was allotted into three replicates (8 birds in each).

2. Housing and management:

Birds were wing - banded, weighted and randomly housed in cages (100X50X50, cm) each cage contains 8 birds and represents one replicate.
All the experimental birds were raised under similar environmental, hygienic and managerial conditions. The composition and chemical analyses of the experimental basal diets (starter and growing) were formulated according to NRC, 1994 are presented in Table 1.

3. Experimental diets:

Each experimental group received one of the following dietary treatments in both starter (7 to 21 day of age) and grower (22 to 45 day of age) periods. In this study we used two popular herbs (Rosemary and saffron) widely used in Egypt and Mediterranean and Middle East areas, both herbs were purchased from Fathalla market (Egypt) The order of dietary treatments was as follows:

1. Basal diet only without supplementation (served as control)
2. Basal diet+ V.E (200 mg/kg feed)
3. Basal diet + Rosemary 1.5 g/kg feed
4. Basal diet + Rosemary 3.0 g/kg feed
5. Basal diet + Rosemary 9.0 g/kg feed
6. Basal diet + Saffron15 ppm/kg feed
7. Basal diet + Saffron 30 ppm/kg feed
8. Basal diet +Rosemary- Saffron (0.75g - 7.5ppm)/kg feed
9. Basal diet + Rosemary- Saffron (1.5g - 15ppm)/kg feed

4. Productive performance:

Live body weight and feed consumed were recorded at 42 days of age for each replicate. Body weight gain and Feed Conversion ratio (gm feed: gm gain) were calculated for each replicate at (1- 6 weeks of age). No mortality was recorded during the whole experimental period.

5. Physiological measurements:

At 6 weeks of age 6 chickens from each treatment were randomly taken and slaughtered, the blood samples were collected into heparinized test tubes, then were centrifuged at 3000 rpm for 20 minutes to separate the plasma. All biochemical analyses (Total protein, Albumin, Glutamyl-transferase (γGT), Glucose, Total Cholesterol, Height density lipoproteins (HDL), Low density Lipoproteins (LDL), Triglyceride, Total Antioxidant capacity and lipid peroxide) were done by using commercial kits produced by bio - diagnostic – Egypt (www.bio-diagnostic.com).

6. Chemical composition of meat:

A sample [a 50/50 (w/w) of skinless boneless from thigh meat] were dried in an air oven at 65 ° C for 48 hours until constant weight. The dried flesh was grounded and carefully kept in well tight glass container pending analysis. This was done according to the method described by **AOAC, (1990).**

7. Statistical analysis:

The differences among treatments were statistically analyzed by general linear model ANOVA using SPSS® statistical software package for windows version 16.0. The significant differences between means were separated by Duncan's Multiple Range-test **(Duncan, 1955).**

RESULTS AND DISCUSSION

Data in Table 2 presents the effect of vitamin E and phytogenic feed additives on Productive performance of broiler chicks from 1-6 weeks of age. The results showed that no significant differences between all treatments except for of rosemary (9 g/kg feed), which had a significantly lower body weight than other treatments.

Body weight gain:

Data illustrated in Table 2 showed the effect of vitamin E and phytogenic feed additives on body weight gain of broiler chicks. The same trend of body weight was observed in body weight gain.

Using growing chicks, **Swain *et al.*, (2000)** reported that chicks received diet supplemented with vitamin E (150 and 300 IU/kg) showed significantly higher body weight gains and efficiency of feed utilization, however, they consumed significantly feed less than those fed the basal diet. The improvements in both of BWG and in FCR have been reported in the literature as for example, when oregano EO was incorporated at 300mg/kg of a wheat–SBM basal diet fed to birds infected with Eimeria tenella, compared to the infected non-supplemented controls **(Giannenas *et al.*, 2003).** Similarly, anise oil supplementation of broiler diets at 400 mg / kg resulted in a significant improvement in BWG and FCR throughout the experiment

compared to the control **(Ciftci *et al*., 2005).**

However, other studies have not demonstrated significant beneficial effects of phytogenics on overall broiler performance. For example, no beneficial effects for growth performance were seen when oregano EO was added at 50 and 100 mg/kg of a wheat–SBM basal diet **(Botsoglou *et al*., 2002)** or when thymol, cinnamaldehyde and a commercial phytogenic preparation were included at 100 mg/kg of a maize–SBM basal diet **(Lee *et al*., 2003) .**

At the end of 6 week, daily live gains differed (P≤0.05) between anise and rosemary treatments. The highest live weight gain was recorded in anise 1% group (92.64g), followed by rosemary group 1% (79.00g), rosemary group (77.86g), anise group 0.5% (69.00g) and control group (66.43g) (P≤0.05) **Tolba, (2010).**

Feed consumption:

Data describing the influence of vitamin E and phytogenic feed additives on feed consumption of broiler chicks during the period from 1 to 6 weeks of age are presented in Table 2. It is clear that addition of vitamin E and phytogenic feed additives to the basal diet of broiler chicks did not significantly affect the feed consumption of the treated groups comparing to the control group. However, only the treatment of Rosemary 9.0 g/kg feed significantly (P≤ 0.05) decreased the feed intake of broiler chicks during the period from 1-6 weeks of age comparing with control and the other experimental groups and this decrease percent was 16.7 % comparing with control group.

Feed conversion ratio:

With respect to the effect of vitamin E and phytogenic feed additives on feed conversion ratio of broiler chicks during the whole experimental period from 1 to 6 weeks of age (Table 2), it could be observed that addition of all feed additives to the basal diet of broiler chicks had insignificant effect on feed conversion ratio during the whole period of experiment. This finding do not apply for the treatment of Rosemary 9.0 g/kg feed which had the worst conversion ration comparing to the other experimental groups (P ≤ 0.05). A linear increase in feed intake and body weight (P≤0.01), and improvement in feed efficiency (P≤0.01) and carcass quality (P<0.05) were found by **Sahin *et al*., (2006)** when vitamin E, 125 or 250 mg /kg diet increased in quail diets reared under heat stress conditions (34 ◦C). They also demonstrated that serum Malondialdehyde (MDA) concentrations linearly increased (P≤0.001) as dietary Vitamin E supplementation increased.

Generally, an improvement in FCR in broilers when feeding phytogenics has been evidenced in the majority of the studies reviewed by **Brenes and Roura, (2010)** who concluded that in most studies the improvement in FCR comes as a result of a reduced FI at a largely unchanged BWG. On the other hand, **Al- Kassie (2008)** reported that 0.5 and 1% rosemary herb supplementation in the diet clearly improved broiler growth performance at 42 days of age, compared with control treatment. **Ghazalah and Ali (2008)** also found that 0.5% rosemary herb supplementation in the diet gave better results than the control treatment at 49 days of age.

Literature shows contradictory results regarding the effects of other phytogenic feed additives on broiler growth performance. For instance, neither **Erdogan *et al.* (2010)** nor **Jang *et al.* (2007)** found any advantage in feeding diets with the addition of commercial mixtures of essential oils.

On the contrary, **Khattak *et al.* (2014) and Mathlouthi *et al.* (2012)** found improvements in broiler growth when the diets supplemented with commercial mixtures of essential oils, rosemary or oregano oil, respectively. However, **Marzoni *et al*. (2014)** reported that no

effect on either the growth or slaughtering performance of Muscovy ducks fed a diet supplemented with rosemary leaves or orange peel extract.

Carcass Characteristics:

Table 3 shows the effect of vitamin E and phytogenic feed additives on carcass characteristics, carcass weight (%), abdominal fat (%) relative weight of liver (%), spleen (%) and bursa of broilers at 6 weeks of age as a percentage of live body weight. No significant effects were observed in these parameters according to the various feed additives. On the other hand, the relative weight of the abdominal fat is significantly decreased in all the treatment comparing to the control group ($P \leq 0.05$). **Abaza, (2002)** demonstrated that the average body weight of Japanese quail received 200 IU vitamin E exceeded that of the control group at six week of age. Insignificant effects were found on kidney and gizzard relative weights. In contrast, breast, thigh and liver as well as spleen relative weights were significantly ($p \leq 0.05$) affected. **Behzad *et al.* (2015)** found that no significant differences ($P \leq 0.05$) between treatments were found in the final body weight or in most carcass traits of broilers chick received different levels of rosemary, our results were also in agreement with **Sharifi *et al.* (2013)** and **Yakhkeshi *et al.* (2012).**

Meat chemical analyses:

Effect of vitamin E and phytogenic feed additives on meat chemical analyses (%) from meat broiler chicks at 6 weeks of age are appears in table 4. The meat content of protein, moisture and ash did not affected by dietary treatments. On the other hand, one of the major finding in this study is both vitamin E and phytogenic feed additives significantly ($P \leq 0.05$) reduced the meat content of fat comparing to the control group. **Lopez-Bore *et al.*, (1998)** found that rosemary at level of 500 mg rosemary leaves / Kg enhanced the oxidative stability of lipids in chicken meat and reduced microsomal and cholesterol oxidation. They reported that the anti-oxidative effect of rosemary extract was related to the concentration of this extract in the product.

Herbal feed additives are often claimed to improve the flavor of meat. Flavor of meat is a complicated indicator, which arises from many factors. Recently, most studies focus on amino acid, fat, fat acid, glycogen, inosine monophosphate (IMP), and so on **(Guo 2003).**

Rosemary (*Rosmarinus officinalis* L.), is used as a functional food, and several extract formulations of rosemary have been proven to have antioxidant and also anti-Campylobacter activity. Interestingly, campylobacters have been confirmed to be more sensitive to rosemary extracts than other gram-negative bacteria, **(Klancnik *et al.*, 2009).** Nowadays it is essential to test new preservation and decontamination procedures using naturally occurring chemicals against important pathogenic bacteria in meat. **(Piskernik *et al.*, 2011)** tested the antimicrobial effect of rosemary extracts and the bacteriocin against Campylobacter jejuni at a low storage temperature ($8^{\circ C}$) with or without short-term pre-freezing. The antimicrobial effect of rosemary extract was four times greater in laboratory media than in chicken meat.

Plasma biochemistry:

Tables 5, 6 and 7 describing the effect of vitamin E and phytogenic feed additives on different biochemical metabolites in plasma of broiler chicks at 6 weeks of age.

In table 5, the lowest value of plasma total protein was recorded for control comparing to the other groups ($P \leq 0.05$). On the other hand, almost the same trend was observed for the level of plasma globulin. Vitamin E Saffron at 30ppm/kg had the highest value. The results of plasma albumin in table 5 did not show any significant differences among the dietary treatments.

These results are in harmony of the

finding of **(Kianbakh and Ghazavi, 2011);** they found that Saffron didn't have any significant effects on the other parameters. No adverse effects were reported. The results suggest that the sub-chronic daily use of 100 mg saffron has temporary immunomodulatory activities without any adverse effects.

Table 5 shows the effect of vitamin E and phytogenic feed additives on plasma (γGT –glucose) of boilers chicks at 6 weeks ages. The same trend of results was obtained in the two parameters, all the dietary treatment had a significantly ($P \leq 0.05$) lower values than the control. It is well documented that there is a positive relationship between high level of plasma triglycerides and glucose and the level of the oxidative stress **(Eid *et al.*, 2003),** which consequently affects negatively the physiological status of the chicks and the production. Raised levels of γGT in the blood are a sensitive indicator of liver disease.

Effect of vitamin E and phytogenic feed additives on Plasma (Total Cholesterol - height density lipoproteins (HDL) - low density Lipoproteins (LDL) - triglyceride) on boilers chicks at 6 weeks ages are presented in table 6. Vitamin E treatment had the lowest plasma level of total cholesterol ($P \leq 0.05$) comparing with other groups followed by Rosemary at 3.0 g/kg feed; this may refer to the strong antioxidant activity of vitamin E **(Eid *et al.*, 2003)** which prevents the molecules from lipid peroxidation. It can notice that both vitamin E and Rosemary3.0 g/kg significantly had the highest level of HDL ($P \leq 0.05$).

Table (6) shows the effect of vitamin E and phytogenic feed additives on plasma triglyceride of boilers chicks at 6 weeks ages. All the dietary treatment had a significantly ($P \leq 0.05$) lower level of the above mentioned parameters than the control group.

Effects of vitamin E and phytogenic feed additives on Plasma total antioxidant capacity and lipid peroxide at 6 weeks of age are illustrated in Table 7. Vitamin E. treatment had the highest plasma level of total antioxidant ($P \leq 0.05$) comparing with other groups; this due to the strong antioxidant activity of vitamin E **(Eid *et al.*, 2003).**

In this respect, **Sahin *et al*. (2006)** demonstrated that serum MDA concentrations linearly decreased ($P \leq 0.001$) as dietary Vit E supplementation increased. **Keshavamurthy *et al.* (2013)** reported that the inclusion of vitamin E through water significantly increased catalase activity and decreased the lipid peroxidation levels by decreasing the formation of Malondialdehyde in the liver tissues comparing to the control group.

Generally, it was recorded that plasma lipid peroxide was significantly($P \leq 0.05$) improved for Rosemary 9.0 g/kg feed in decreasing plasma lipid peroxide as compared to control.

Vitamin E is essential for many body functions such as growth, immune function enhancement, tissue integrity, reproduction, disease prevention, and antioxidant function in biological systems **(Dalle Zotte and Szendrő, 2011).** Vit E has a positive effect on the antioxidative properties; it is a very efficient scavenger of free radicals **(Castellini *et al.*, 1998; Tres *et al.*, 2010).** It has been shown that vitamin E is present in the cell membrane of spermatozoa, where it helps to maintain membrane integrity **(Donoghue and Donoghue, 1997).**

In general, based on the results of the present study, it can be concluded that the diet supplementation with vitamin E and phytogenic feed additives except the treatment received 9 g rosemary /kg feed may exert a beneficial effects on performance, carcass characteristics and plasma blood constituents in broiler chicks.

Table (1): Composition and calculated analysis of the basal experimental diets.

Ingredients (%)	Starter	Grower
Yellow Corn	57.00	67.08
Soybean meal(44%cp)	26.50	23.50
Corn gluten (60%)	10.00	2.50
Sun flower oil	2.25	2.48
Bone charcoal	2.50	2.50
Limestone	0.80	0.80
Sodium Chloride	0.30	0.30
Vit. and Mineral mix*	0.40	0.40
DL-Methionine	0.05	0.18
Lysine	0.20	0.26
Total	100.00	100.00
Calculated analyses: **		
Crude protein (%)	22.5	17.54
ME kcal/kg	3102	3099
Crude fat (%)	5.00	5.38
Crude fiber (%)	2.93	2.92
Calcium (%)	1.00	1.05
Phosphorus available (%)	0.45	0.47
Mathionine(%)	0.50	0.50
Mathionine+cysteine(%)	0.88	0.81
Lyine (%)	1.18	1.10

* Each kg of Vitamins and Minerals mixture contains: Vit. A,4,000, 000 IU; Vit. D3 5000,000 IU; Vit. E 16.7g; Vit. K 0.67g; Vit. B_1, 0.67g;Vit. B_2, 2g ; Vit. B_6, 0.67 ;Vit. B_{12} 0.004 ; Pantothenic acid 6.67g; Nicotinic acid 16.7g;Folic acid 1.67g; Biotin.0.07g; Choline 004g;Manganese 133.4g; Zinc 23.3g; Copper 1.67g;lron 25g; Iodine 0.25g; Fe 25g ;ethoxyquin 0.033g.

******Calculated values were according to NCR (1994) text book values for feedstuffs all the experimental diets were formulated to meet or exceed the National Research council recommendation (NRC.1994).

Table (2): Effect of vitamin E and phytogenic feed additives on Productive performance of broiler chicks from (w1-w6) of age.

Treatments	Productive performance (W1-w6)			
	Body weight (g)	**Body weight gain (g/bird/period)**	**feed consumption(g feed/bird/period)**	**feed conversion ratio**
Control	1811.40±52.82[a]	1594.50±51.92[a]	3144.10±111.03[a]	1.71±0.82[b]
Vitamin E	1932.20±55.63[a]	1716.60±55.42[a]	3103.40±86.46[a]	1.61±0.63[b]
Rosemary 1.5 g/kg feed	1839.60±52.12[a]	1623.60±52.26[a]	2984.20±123.75[a]	1.62 ±0.12[b]
Rosemary 3.0 g/kg feed	1797.10±57.73[a]	1581.10±57.14[a]	2891.60±67.44[a]	1.61±0.73[b]
Rosemary 9.0 g/kg feed	1548.80±46.15[b]	1334.60±46.30[b]	2618.40±34.72[b]	2.37±0.15[a]
Saffron 15 ppm/kg feed	1880.40±40.92[a]	1665.30±41.12[a]	3096.30±150.98[a]	1.65±0.92[b]
Saffron 30ppm/kg feed	1847.50±40.51[a]	1631.50±41.15[a]	3181.80±100.67[a]	1.72±0.51[b]
Rosemary- Saffron (0.75g -7.5ppm) /kg feed	1812.10±52.09[a]	1596.40±51.27[a]	3213.40±83.50[a]	1.77±0.09[b]
Rosemary- Saffron (1.5 g-15ppm) /kg feed	1803.40±58.47[a]	1587.50±58.65[a]	3085.40±97.93[a]	1.71±0.47[b]

[a] and [b] Means in the same column having different letters are significantly different (P≤0.05).

Table (3): Effect of vitamin E and phytogenic feed additives on carcass Characteristics: Carcass weight (%), abdominal fat (%), liver (%), spleen (%) and bursa (%) of broiler chicks at 6 weeks of age.

Treatments	Carcass characteristics, (%)				
	Carcass weight	Abdominal fat	Liver	Spleen	Bursa
Control	70.34±1.03	1.592±0.164[a]	2.53±0.01	0.13±0.02	0.05±0.01
Vitamin E	72.38±0.45	0.950±0.312 [b]	2.27±0.12	0.13±0.02	0.06±0.01
Rosemary 1.5 g/kg feed	72.51±1.55	1.018±0.327 [b]	2.52±0.14	0.12±0.01	0.07±0.01
Rosemary 3.0 g/kg feed	72.99±3.91	0.980±0.044 [b]	2.63±0.15	0.14±0.03	0.05±0.001
Rosemary 9.0 g/kg feed	68.78±3.44	0.966±0.337 [b]	2.80±0.21	0.13±0.03	0.13±0.04
Saffron 15 ppm /kg feed	71.05±0.82	1.019±0.312 [b]	2.44±0.05	0.13±0.01	0.07±0.01
Saffron 30ppm/kg feed	72.45±2.11	1.070±0.428 [b]	2.44±0.05	0.11±0.02	0.05±0.01
Rosemary- Saffron (0.75g -7.5ppm)kg feed	70.71±1.26	0.804±0.114 [b]	2.69±0.22	0.11±0.01	0.04±0.002
Rosemary- Saffron (1.5 g-15ppm)/kg feed	71.04±0.72	1.030±0.417 [b]	2.44±0.33	0.11±0.01	0.07±0.007

[a] and [b] Means in the same column having different letters are significantly different (P≤0.05).

Table (4): Effect of vitamin E and phytogenic feed additives on meat chemical analyses (%) from meat of broiler chicks at 6 weeks of age**.**

Treatments	Meat chemical analyses %			
	Protein	**Moisture**	**Fat**	**Ash**
Control	19.86±0.51	48.96±14.53	1.74±0.06^{a}	4.76±0.26
Vitamin E	20.43±0.34	45.87±12.11	0.94 ± 0.01^{b}	4.96±0.18
Rosemary1.5 g/kg feed	20.64±0.80	46.85±26.22	0.89 ± 0.02^{bc}	2.42±1.31
Rosemary 3.0 g/kg feed	20.41±0.98	69.48±1.92	0.87 ± 0.03^{bc}	4.66±0.63
Rosemary 9.0 g/kg feed	20.31±0.61	73.94±1.76	0.74 ± 0.02^{c}	1.82±0.74
Saffron15 ppm /kg feed	19.99±0.52	65.94±4.65	0.83 ± 0.06^{bc}	2.28±1.15
Saffron 30 ppm /kg feed	19.75±1.30	42.28±10.17	0.83 ± 0.04^{bc}	4.90±2.10
Rosemary- Saffron (0.75g -7.5ppm)/kg feed	19.99±0.70	44.62±16.14	0.82 ± 0.09^{bc}	3.74±0.41
Rosemary- Saffron (1.5 g-15ppm)/kg feed	20.81±0.44	55.25±14.84	0.81 ± 0.03^{bc}	5.01±0.58

$^{a-b}$ and ^{c} Means in the same column having different letters are significantly different (P≤0.05).

Table (5): Effect of vitamin E and phytogenic feed additives on Plasma (Total Protein- Albumin-Globulin - gamma-glutamyl-transferase (γGT**) –**Glucose) of boiler chicks at 6 weeks of age.

Dietary Treatments	**Blood Plasma Parameters**				
	Total Protein (g/dl)	**Albumin (g/dl)**	**Globulin (g/dl)**	**γGT (u/l)**	**Glucose (g/L)**
Control	5.13±0.23^{c}	3.49±0.39	1.64±0.05^{c}	12.58±0.89^{a}	294.76±13.55^{a}
Vitamin E	6.38 ±0.17^{a}	3.93±0.13	2.45±0.18^{a}	7.00±1.55^{b}	209.64±17.09^{b}
Rosemary 1.5 g/kg feed	6.17±0.22^{ab}	3.88±0.25	2.29±0.18^{ab}	6.89±1.72^{b}	192.38±18.60^{b}
Rosemary 3.0 g/kg feed	6.19±0.26^{ab}	4.12±0.46	2.27±0.18^{ab}	7.97±0.33^{b}	190.97±10.65^{b}
Rosemary 9 g/kg feed	6.02±0.25^{b}	4.01±0.14	2.01±0.07^{b}	6.57±1.63^{b}	184.43±18.61^{b}
Saffron15 ppm/kg feed	6.15±0.20 ^{ab}	4.33±0.29	1.72±0.14^{bc}	7.69±0.84^{b}	219.98±16.22^{b}
Saffron30 ppm/kg feed	6.20±0.23^{ab}	4.08±0.31	2.45±0.19^{a}	6.94±1.82^{b}	209.51±11.52^{b}
Rosemary- Saffron (0.75 g -7.5ppm)/kg feed	6.14±0.42^{ab}	4.03±0.28	1.82 ±0.04^{bc}	7.35±0.67 ^{b}	205.07±8.84^{b}
Rosemary- Saffron (1.5 g-15ppm)/kg feed	6.21±0.41 ^{ab}	4.45±0.63	1.85 ± 0.23^{bc}	6.94±1.55 ^{b}	214.45±11.32^{b}

$^{a-b}$ and ^{c} Means in the same column having different letters are significantly different (P≤0.05).

Table (6): Effect of vitamin E and phytogenic feed additive on Plasma (Total Cholesterol - height density lipoproteins (HDL) - low density Lipoproteins (LDL) - Triglyceride) of boiler chicks at 6 weeks of age.

Dietary Treatments	Blood Plasma Parameters(g/dl)			
	Total Cholesterol (g/dl)	HDL (g/dl)	LDL (g/dl)	Triglyceride (mg/dl)
Control	165.55±3.31^{a}	77.01±5.03^{b}	33.93±1.14^{a}	101.96±2.15^{a}
Vitamin E	118.71±9.16^{c}	115.62±6.86^{a}	24.00±0.93^{b}	89.85±10.91^{b}
Rosemary1.5 g/kg feed	141.45±10.76^{ab}	91.53±1.01^{b}	24.37±1.93^{b}	83.96±4.67^{b}
Rosemary3.0 g/kg feed	132.53±15.51^{b}	100.25±9.75^{a}	26.90±3.40^{b}	87.18±3.70^{b}
Rosemary9.0 g/kg feed	148.71±9.16 ^{ab}	79.92±11.97^{b}	25.07±1.52^{b}	84.41±9.47 ^{b}
Saffron15 ppm/kg feed	151.37± 4.86^{ab}	83.68±0.58^{b}	31.60±6.81^{b}	84.50±6.22^{b}
Saffron30ppm/kg feed	144.36±11.47^{ab}	88.68±4.68^{b}	28.10±5.12^{b}	93.29±4.75^{b}
Rosemary- Saffron (0.75 g -7.5ppm) /kg feed	153.04±4.16^{ab}	94.10±2.11^{b}	35.43±2.71^{b}	81.00±5.03^{b}
Rosemary- Saffron (1.5 g-15ppm) /kg feed	119.26±6.53 ^{ab}	73.08±3.08^{b}	26.37±1.01^{b}	94.50±7.91^{b}

$^{a-b}$ and ^{c} Means in the same column having different letters are significantly different (P≤0.05).

Table (7): Effect of vitamin E and phytogenic feed additive on Plasma Total Antioxidant capacity (mg/dl) and lipid peroxide (nmol/ml) of boiler chicks at 6 weeks of age.

Dietary Treatments	**Blood Plasma**	
	Antioxidant capacity (mg/dl)	**lipid peroxide (nmol/ml)**
Control	0.50±0.10[d]	3.04±0.30[a]
Vitamin E	1.84±0.08[a]	2.26±0.07[b]
Rosemary 1.5 g/kg feed	1.64±0.05[b]	2.29±0.10[b]
Rosemary3.0 g/kg feed	0.83±0.05[c]	2.12±0.13[b]
Rosemary 9.0 g/kg feed	0.89±0.07 [c]	2.07±0.06[b]
Saffron15 ppm/kg feed	0.83±0.12 [c]	2.21±0.11[b]
Saffron 30ppm/kg feed	0.86±0.08 [c]	2.43±0.05[b]
Rosemary- Saffron (0.75g -7.5ppm)/kg feed	0.84±0.05 [c]	2.26±0.11[b]
Rosemary- Saffron (1.5 g-15ppm)/kg feed	0.86±0.15[c]	2.27±0.09[b]

[a-b] and [c] Means in the same column having different letters are significantly different($P \leq 0.05$).

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الملخص العربى

تأثير فيتامين هـ والاضافات العلفيه ذات الأصل النباتى على الاداء الانتاجى ومكونات الدم والصفات المضادة للاكسدة فى دجاج التسمين

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تم تقسيم عدد ٢١٦ كتكوت هبرد غير مجنس عمر ٧ أيام عشوائياً الى ٩ مجموعات تجريبية .احتوت كل مجموعة على ٢٤ كتكوت، احتوت كل مجموعة على ٣ مكررات (٨ طيور لكل مكرره)، وتم تربية الطيور فى مسكن مفتوح. احتوت العليقة على ٢٢,٥ و١٧,٥% بروتين خام و٣١٠٠ و٣٠٠ كيلو كالورى طاقة ممثلة/كجم عليقة لعليقتى البادىء والنامى على الترتيب.

وتم تكوين العلائق التجريبية كما يلى:-

العليقة الاساسية بدون أى إضافات (استخدمت كمجموعة اساسية "كنترول")، ٢- العليقة الاساسية + ٢٠٠ مج فيتامين هـ /كجم ، ٣- العليقة الاساسية + ١,٥ جم روزمارى /كجم علف ، ٤- العليقة الاساسية + ٣ جم روزمارى /كجم علف ،٥- العليقة الاساسية + ٩ جم روزمارى /كجم علف ، ٦- العليقة الاساسية + ١٥ ملجم زعفران /كجم ، ٧- العليقة الاساسية + ٣٠ ملجم زعفران /كجم ، ٨- العليقة الاساسية + ٠,٧٥ جم روزمارى /كجم + ٧,٥ ملجم زعفران /كجم ، ٩- العليقة الاساسية +١,٥جم روزمارى /كجم + ١٥ ملجم زعفران /كجم علف. اظهرت النتائج ان أعلى وزن جسم سجل للطيور التى تغذت على ٢٠٠ مج فيتامين هـ /كجم علف(١٩٣٢جم) و ١٥ ملجم زعفران /كجم علف (١٨٨٠ جم). سجلت المجموعه السادسه أعلى معدل استهلاك غذائى. أفضل نسبة كفاءة تحويلية سجلت فى المجموعه الثالثه .معظم قياسات الذبيحه لم تختلف باختلاف المعامله. استخدام الاضافات المختلفه حسن من الكفاءه الكلية لمضادات الاكسده فى البلازما وايضا لم تكن هناك اختلافات معنوية عند التغذية على كل المعاملات. كما اظهرت نتائج هذه الدراسة ان الأعشاب الطبيعية (الروزمارى والزعفران) لديها خواص مضاده للأكسدة ويمكن استخدامها كإضافات غذائية فى علائق دجاج التسمين.قيمة دليل أكسدة الدهون فى بلازما الدم تناقصت عند اضافة الأعشاب الطبيعية لعلائق دجاج التسمين.ارتفعت قيمة البروتين الكلى فى السيرم عند التغذية على العليقة الاساسية مضاف إليها الأعشاب الطبيعية. لم يكن هناك إختلاف معنوى بين المعاملات فى محتوى اللحم من البروتين الخام، الدهن والرماد.

توضح هذة البيانات ان اضافة فيتامين هـ والأعشاب الطبيعية مثل الروزمارى والزعفران فيما عدا المعاملة المضاف اليها ٩ جم روزمارى /كجم علف فى علائق دجاج التسمين يؤدى لتحسين الأداء الانتاجى للطيور وصفات الذبيحة ومكونات سيرم الدم والخواص المضادة للاكسدة.