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EFFECTS OF SPRAYING EGGS WITH GARLIC OIL ON HATCHING TRAITS, POST-HATCH CHICK GROWTH AND PHYSIOLOGICAL RESPONSE OF HATCHED SINAI CHICKS

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ABSTRACT: The goal of this research was to find out more about the effect of spraying garlic oil solution before incubation as natural products for egg disinfection of hatching eggs on hatching traits, post-hatch chick growth and physiological response of hatched Sinai chicks. Six hundreds of hatching eggs were randomly separated into 4 treatments (each treatment represented with three replicates). The experimental groups were arranged as follows, the 1st group (T1) used as positive control (which eggs were fumigated with formaldehyde, the second group (T2) was sprayed with distilled water as a negative control, third group (T3) was sprayed with garlic oil solution 2ml/litter and the fourth group (T4) sprayed garlic oil solution 3 ml/litter. Results revealed that chick weight, chick shank length, chick body length and hatchability tended to be significantly higher ($P<0.05$) in eggs treated with garlic oil solutions when compared to control group. Embryonic mortality and egg weight loss ratio during 18 days of incubation were considerably (P0.05) lower in eggs sprayed with garlic oil solutions as compared with control group. Blood haematological parameters (RBCs, Hb, and WBC) were unaffected at hatch and at 28 days, with the exception of a modest rise in WBC count at 28 th day in response to spraying with garlic oil solution. In response to spraying garlic oil solutions, carcass contents of chicks at hatch and growth performance (body weight, feed intake, and body weight gain) of chicks during the experimental period (28 days showed significantly higher values and feed conversion improvement, while the residual yolk of chicks at hatch, , was lower than those in the control group. Comparing to control groups, garlic oil application had a substantial impact on TAOC at hatch and after 4 weeks of age. Cholesterol, triglyceride, plasma total protein, albumin, LDL and HDL were significantly differed ($p<0.05$).
We concluded that pre-incubation spraying of eggs with garlic oil solution as a natural disinfectant is an effective way to improve hatchability, post-hatch chick development, and physiological response of hatched Sinai chicks.

Keywords: spraying eggs, Garlic oil hatching traits, physiological response, chick growth.

INTRODUCTION

Hatchability is one of the most important factors in the hatchery industry. Improving hatchability and chick quality is a crucial step in improving chicken production efficiency. As a result, both before and after egg laying, eggs are exposed to microbial contaminations such as Salmonella, E. coli, enterobacteria, moulds, and yeasts, which can pierce the egg shell, resulting in poor hatchability and incubation efficiency (De Faria et al., 2014). . Microorganisms may taint fertile eggs during their passage through an infected oviduct, lying in a dirty nest, or being kept in a polluted cage. To promote hatchability, a comprehensive hatching sanitation programme is required prior to incubation. Commercially, paraformaldehyde is usually used to fumigate hatching eggs (Kusstatscher et al., 2017). This method significantly reduces the number of potentially harmful germs (Rui et al., 2011), but it has negative consequences for both the embryo and the human (Zeweil et al., 2015; Kusstatscher et al., 2017). As a result, new sanitization agents are needed that are both safe and effective without jeopardising incubation efficiency or human health. Many studies have used natural substances as formaldehyde substitutes, such as garlic oil (Fouad et al., 2018). Garlic has antibacterial, antioxidant, anticancer, anti-inflammatory, and cardiovascular-protective properties, according to Reuter et al. (1996).Garlic extract at a dosage of 750-1000 g/ ml demonstrated a very good antibacterial activity against both gram-positive and gram-negative bacteria in a study by Astal and Younis (2003). Copur et al. (2011) mentioned that treating breeder broiler eggs with allicin (3600 mg/l and 7200 mg/l) is a safe alternative to formaldehyde fumigation, resulting in improved hatchability, decreased contamination rates, and lower death rates. According to Baylan et al. (2018) quail eggs can be immersed in garlic extract at different doses (2.5 and 5.0 percent) as an alternative to formaldehyde fumigation. According to Fouad et al., 2018, spraying garlic oil solution (1ml/l or 2ml/l) on Japanese quail eggs before incubation improved embryonic growth, hatchability, hatch weight, and chick performance. Prior studies had only looked at utilizing garlic oil or other natural options to disinfect hatching eggs before placing them in an incubator. Therefore, the objective of this study was to evaluate spraying of eggs with garlic oil pre-incubation, to evaluate its effect weight loss, hatchability, embryonic mortalities, and hatch weight.

MATERIALS AND METHODS

This experiment was carried out at EL-Serw Poultry Research Station, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt during February and March, 2021 All eggs were obtained from Sinai birds (local strain), aged eight months of age and fed a starter layer ration. Garlic oil was obtained from Elmasrayia Company, Egypt. Garlic oil solution was prepared by mixing 1000 ml distilled water (25-27 ºC) with 2ml or 3 ml garlic oil respectively (using 1ml Mono propylene glycol to distilled water (to make sure that the oil is mixed with water) . A total number of 600 hatching eggs (54 – 55 g) were obtained and randomly assigned to 4 treatments, each treatment containing 150 eggs were subdivided into 3 replicates of 50 eggs. T1 group was subjected to formaldehyde fumigation (positive control Eggs of 2

group were sprayed with distilled water (negative control), T 3 eggs were sprayed with garlic oil solution 2ml / litter and T4 eggs were sprayed with garlic oil solution 3 ml / litter. Spraying distilled water or garlic oil was applied just before setting of eggs into incubator. Treatments T2, T3, and T4 were sprayed homogeneously over the entire egg surface using hand sprayers. After being sprayed, the eggs remained in the stands to dry at room temperature for 30 min. Each tray was individually weighed before incubation and on day 18 of incubation on a precision scale to evaluate the weight loss percentage throughout the setting phase at incubation. Eggs were incubated vertically with broad end up in the setting trays in automatic incubator at 37.5˚C (dry bulb temperature), with 56 % relative humidity. Eggs were turned automatically every 1 h with angle ± 45 degree. On day 18 of incubation, the eggs were transferred to the hatchery at 36.5˚C (dry bulb temperature), with 60-65% relative humidity until the end of hatching period. After 21 days of incubation, the un-hatched eggs were counted, opened, and examined to determine the percentage of infertile eggs and the percentage of embryonic deaths .Then hatched chicks and accumulative embryonic mortality (un-hatched eggs with live or dead embryos and dead hatched chicks) were counted. Hatched chicks were weighed, then, hatchability and embryonic mortality percentages were calculated.

Egg weight loss

Eggs were weighed before setting in the incubator, then on 18th day of incubation. The differences between two successive weights of incubated eggs were estimated in grams and percentage from initial egg weight. Egg weight loss (%) = [(egg weight at setting– egg weight at 18 days of incubation) / initial egg weight at setting] ×100

Embryonic mortalities

Un-hatched eggs were submitted to embryo diagnosis and the infertile eggs were excluded. Then only the number of fertile unhatched eggs were used to determine the percent of early mortality (EM, 0-7 days), intermediate mortality (IM, 8-15 days), and late mortality (LM, 16-21 days).

Hatchability percentage

Hatchability of fertile eggs % = (Number of hatched chicks) / (Number of fertile eggs) × 100

Chick yield % = Chick weight at the day of hatch / Initial egg weight x 100

Chick Quality

The chicks were counted and individually weighed. Chick length was measured from the tip of beak to the toe, chick shank lengths was measured and remaining yolk was weighed.

All hatched chicks from each treatment were weighed and reared up to 4 weeks of age under similar hygienic and managerial conditions. Composition and calculated analysis of the basal starter diets are shown in Table 1. Bird Live body weight (LBW) and feed consumption (FC) were recorded for replicates then were averaged and expressed in grams per chick. Body weight gain (BWG) and feed conversion ratio (FCR) were calculated during the same period. Slaughter test was carried out at hatch and at 28 th day of age for determining some weights of body parts and blood constituents.

Hematological parameters and organ weight measurements:

At hatch and the end of experimental periods, 3 chicks per treatments were slaughtered. Blood samples were

collected in heparinized tubes to estimate blood hematology, while another non-heparinized blood was centrifuged (3500 rpm) for 15 minutes to obtain blood serum to estimate glucose, cholesterol, triglycerides, total protein, albumin, HDL, VLDL and total anti-oxidant (TAOC)**.** After slaughter and complete bleeding, the birds were dressed and different body parts (liver, gizzard, heart, bursa, spleen and residual yolk weight at hatch only were weighed .Relative weights of different body parts were calculated as percentage of live body weight.

Statistical analysis

Data obtained were statistically analyzed using the General linear models procedure of SAS (2004).

In case of significant differences ($P<0.05$), means were compared by Duncan's test.

Statistical model: $Xij=\mu + Ti + eij$

Where;

Xij= the observation record; μ= Overall mean; Ti= Effect of treatment; eij= random error.

RESULTS AND DISCUSSION

Egg weight loss

As illustrated in Table 2, egg weight loss % was measured during the setting phase of incubation period (0 to 18 days) of. All groups lost between 8.65 and 9.34 percent of their weight in eggs. Eggs weight loss percentage were not statistically differs among all experimental groups .Group 2 had the largest egg weight loss percentage , whereas groups 3 and 4 had lower egg weight loss percentage. This result was consistent with that observed by Fouad et al. (2018) who found that eggs sprayed with garlic oil before incubation weighed less than eggs sprayed with water or untreated eggs. The reduction in water loss could be ascribed to egg pores coated with garlic oil (Fouad et al., 2018), which reduced water vapor evaporation (Shahein and Sedeek, 2014). This can be explained by a reduction in water loss due to egg pores being coated with garlic oil solution after spraying. Incubation is influenced by the weight loss of the eggs. Moisture loss was detrimental to normal embryonic growth (Geng and Wang 1990). Egg weight loss rate due to the treatment of eggs with disinfectants is reasonable because antiseptics may affect the cuticle layers and porosity of shell. This view was confirmed by Brake and Sheldon (1990) who noted that any change or removal of the cuticle by antiseptics may have a significant impact on egg weight loss and hatchability. This result can be explained by the light of occluded egg pores due to the oily nature of these disinfectants, which reduced the evaporation of water vapor and egg weight loss percentage (Shahein and Eman 2014).

Hatchability of fertile eggs

Hatchability of fertile eggs was significantly increased in treated groups with garlic oil solution in comparison with untreated ones (Table 2). The highest value was observed in eggs sprayed by 3ml/l garlic oil solution versus the lowest one in control. Spraying fertile eggs with either 2ml/L or 3ml/L garlic oil solution led to an increase in hatchability of fertile eggs by 2.42 and 2.77 % as compere to the control group (T.2), respectively. Consequently, embryonic mortality had significant difference between treated groups with garlic oil solution and untreated groups (Table 2). The lowest mortality percent was estimated in eggs sprayed by 2ml/L and 3ml/L garlic oil solutions compared to untreated groups. This result was similar

to that of Fouad et al (2018), who found that hatching eggs cleaned with garlic oil solution represented decreased of embryonic mortalities. In addition, compared to fumigated or non-treated eggs, garlic extract used to disinfect eggs before incubation resulted in lower embryonic mortalities. Improved hatchability may be due to decline the embryonic mortality, where garlic oil solution can be considered an anti-stress agent (Baylan et al., 2018). Garlic has been shown to have antimicrobial effects as well (Iwalokun et al., 2004; Gbenga et al., 2009). The enhanced hatchability could be due to the eggs being treated with garlic oil having less microbial contamination. Hatchability was improved in other studies that used natural product alternatives for egg disinfection, such as allicin (Copur et al., 2011), propolis (Shahein and Sedeek, 2014), garlic extract (Baylan et al., 2018), and garlic oil (Fouad et al., 2018).

Chick body weight at hatch

Results in Table (2) showed significant (P<0.05) increase of chick body weight at hatch in treated groups. Spraying fertile eggs with 2 ml/L or 3ml/Lgarlic oil solutions resulted in an increase in body weight 4.07% and 5.16 %, respectively compared with control group (T2). Chicks for T4 group were heaviest (P0.05) compared to other treatments . This could be due to the eggs losing the least amount of weight during incubation period (Table 2). A study indicated that increasing the weight loss of incubation eggs reduces the weight of chicks (Peebles et al., 1987). Excess water evaporation from eggs is absorbed into new tissues and affects the chick's weight (Davis et al., 1988).

Chick yield %.

There was a difference in chick yield between the treatments (Table 2), these differences were not significance. The group 4 presented a higher chick yield value (67.2 %,) than those of the negative control (T2) and positive control (T1) (63.59%, 64.07 % respectively. According to Aviagen (2011), proper incubation time and conditions, as well as improved chick quality, are required to achieve the ideal chick yield (between 67 and 68 percent) (Boleli et al., 2016). In the current investigation, eggs treated with garlic oil (3ml/litter) produced "excellent" chick yields (Table 2).

Growth performance:

The chicks' growth performance (final body weight, body weight gain and feed conversion) is shown in Table 3. Chicks treated with garlic oil had higher final body weight and body weight gain (P<.05) than eggs sprayed with water or positive control groups, as well as a higher feed conversion rate. As viable eggs were sprayed with 2 ml/L or 3ml/L garlic oil solution, final body weight increased by 2.86 and 6.46 percent, and body weight gained by 2.69 and 6.55 percent, respectively, when compared to the negative control**.** Tekeli et al. (2006) has been reported that the contribution of other plant extracts such as garlic improves live weight gains and feed conversion rate of broilers, also increasing the number of intestinal lactic acid bacteria. Garlic in broiler chick feed had a considerable positive influence on carcass yield and increased chicken vitality, according to Fadlalla et al. (2010). Garlic is a potential feed addition that has recently been discovered to have beneficial impacts on the production performance of broiler chickens and laying hens, according to Khan et al. (2012). Growth, feed efficiency, and

immunological activation have all shown to be beneficial. Consequently, mortality rate had significant difference between treated groups with garlic oil solution and untreated groups (Table 4). When compared to untreated groups, eggs sprayed with 2ml/L and 3ml/L garlic oil solution had the lowest mortality rate.

Weights of some body parts:

Some measurements of hatched chicks (chick length, chick shank) and relative weights of liver, gizzard, heart, yolk residual, , spleen and Bursa at hatch for chicks are presented in Table (4). Garlic oil spraying as an alternate disinfectant for hatching eggs had no discernible effect on the hatched chick shank length .besides liver, gizzard and heart relative weight for chicks of treated groups, comparing with water or positive control groups, while residual yolk, chick length, bursa and spleen weights were significantly differ . The lowest residual yolk % was recorded in eggs sprayed by 3ml/L (5.99 %) , 2ml/L (9.19)garlic oil solution and positive control(9.19) compared to untreated groups(10.24%).In the same trend , tallest chick lengths for T4 , T3 and T1 groups were recorded comparing with negative control .Also data of table 4 showed no statistical differences between garlic oil, negative control and positive control formaldehyde treatments with respect to chick length, chick shank, liver weight, Gizzard, and heart weights at 28 th day of age (Table 5). The tallest chick length and chick shank were obtained from the T4 group (41 cm and 10.8 cm) respectively , while the shortest ones were obtained from the negative control treatment with 37.02 cm and10.2 cm, respectively compared to the negative control. Moreover Liver and heart weights were slightly higher in positive control formaldehyde fumigation comparing to other treatments. Increased garlic oil concentration had no statistical effect on gizzard weight, but the highest value of gizzard weight was achieved with negative control. Bursa weight and spleen weight were significantly differed between treatments (Table 5). Treated groups with garlic oil solution had the lowest values of bursa weight (0.2 and 0.21 respectively in comparison with untreated ones (Table 5). The highest weight of spleen weight was observed in group of eggs sprayed by 3ml/L garlic oil solution versus the lowest one in positive control.

Blood hematological traits:

Results in Table 6 showed no statistical differences among the experimental groups with respect to hematological parameters for chicks at hatch .As fertile eggs were sprayed with either 2ml/L or 3ml/L garlic oil solutions, RBCs increased by 18.18 and 20.32 percent, Hb increased by 23.07 and 31.09 percent, and W.B.c.s increased by 26.63 and 30.4 percent, respectively, when compared to those for the negative control

Blood constituents

Results in Table (6) recorded that values of blood biochemical constituents (total protein, albumin, HDL and Triglyceride) for chicks of treated groups were greater than those of the negative control group. While cholesterol, glucose and LDL were significantly decreased for all treated groups. Garlic oil spraying resulted in the best rate of blood components, possibly due to optimal low density cholesterol and Low density lipids (LDL), (Fadlalla et al., 2010). Khan et al. (2012) reported that, garlic (Allium sativum) stimulates the immune system and lowered blood cholesterol levels in poultry, as well as it is one of the most potential feed supplement which has recently been

reported as having a wide range of beneficial effects on the physiological biochemistry of broilers. Results in Table 6 show that Spraying fertile eggs with either 2ml/L or 3ml/L garlic oil solution led to in a significant ($p<0.05$) increase in total antioxidant capacity (TAOC) for chicks at hatch compared with those of positive and negative control. The existence of several biologically active organic sulphur compounds in garlic has been attributed to its chemical protective potential. These chemicals may have antioxidant properties (Fanelli et al. 1998; Siegers et al. 1999). Garlic's oxidative stress characteristics may be due to its sulphur component in various stages. These findings could be owing to the embryos' good health, which could be caused by treatment with garlic oil solution, as described by Fadlalla et al. (2010).

Blood hematological traits:

Results of Table 7 indicated that blood hematological traits (hemoglobin and RBCs) of Sinai chick at 28 days of age were not significantly affected by spraying hatching eggs by garlic oil, group of eggs which spraying by garlic oil (3m/L) led to increase of hemoglobin value as compared with other treatments, while the lowest value of RBCs was recorded with T3 (2ml/L). White blood cells were significantly increased by spraying garlic oil. by 11.49 and 12.66 % for chicks of T3 and T4 groups' . respectively as compared with negative control, while WBC in positive control was significantly decreased by 32.1 % comparing with negative control.

Blood constituents

Serum constituents for chicks hatched from eggs sprayed by garlic oil were estimated to show the metabolic status and consequently the health of Sinai chicks at 28th day of age. Spraying hatching eggs by garlic oil had no significant influence on serum total proteins, albumin and HDL levels of Sinai chicks at 28 th day of age (Table 7). The highest values of both total protein and HDL were recorded with T3 (2.8 and 47.5) respectively, on other hand, the lowest value of albumin was achieved with the positive control (1.53). Results in Table 6 show significant effects of garlic oil spraying on LDL, cholesterol, triglyceride, LDL, glucose and TAOC level. Group of eggs which sprayed with 2ml/1L) had significantly lowered serum cholesterol, LDL, and glucose concentrations by 17.78, 48.36 and 33.5 %, respectively. Table 7 shows also that in T.A.O.C were differ significantly between treatments under study; the highest values were recorded with T4 followed by T3, while the lowest values were recorded with negative control.

CONCLUSION

It could be concluded that, using garlic oil solution (2ml/L or 3ml/L) as natural material for spraying eggs may be a good way to improve hatching traits, post-hatch chick growth and physiological response of hatched Sinai chicks.

Table (1): Composition and calculated analysis of the basal diet

Ingredients %	**Starter**
Yellow Corn	64.00
Soybean meal (44%)	32.10
Di-calcium phosphate	1.800
Limestone	1.40
Vit.&Min. Premix[1]	0.30
NaCl	0.30
DL.Methionine	0.01
Total	100
Calculated Analysis[2]	
Crude protein %	19.10
ME (Kcal / kg)	2863
Crude fat %	2.91
Crude fiber %	3.82
Calcium %	1.06
Av.phosphorus %	0.47
Lysine %	1.10
Methionine %	0.43
Methi+ Cyst %	0.75

1- Each 3 kg of the Vit and Min. premix manufactured by Agri-Vit Company, Egypt contains: Vitamin A 10 MIU, Vit. D 2 MIU, Vit E 10 g, Vit. K 2 g, Thiamin 1 g, Riboflavin 5 g, Pyridoxine 1.5 g, Niacin 30 g, Vit. B12 10 mg, Pantothenic acid 10 g, Folic acid 1.5 g, Biotin 50 mg, Choline chloride 250 g, Manganese 60 g, Zinc 50 g, Iron 30 g, Copper 10 g, Iodine 1g, Selenium 0. 10 g, Cobalt 0.10 g. and carrier CaCO3 to 3000 g.

2- According to Feed Composition Tables for animal and poultry feedstuffs used in Egypt (2001)

Table (2): Effect of spraying hatching eggs by garlic oil on egg weight loss %, hatchability of fertile egg %, total embryonic mortality %, chick weight at hatch (g) and Chick yield %

Traits	**Treatments**				**Pooled SEM**	**Sig**
	T1	**T2**	**T3**	**T4**		
Egg weight loss %(0-18 days)	9.13	9.34	9.03	8.65	0.37	N.S
Hatchability of fertile egg %	93.46^{a}	91.84^{b}	94.07^{a}	94.39^{a}	0.33	*
Total embryonic mortality %	6.54^{b}	8.18^{a}	6.44^{b}	5.6^{c}	0.29	*
Chick weight at hatch (g)	35.21^{b}	35.05^{b}	36.48^{a}	36.86^{a}	0.27	*
Chick yield %	64.07	63.95	64.49	67.2	0.75	N.S

a,b,c :means in the same row bearing different superscript are significantly different ($P \leq 0.05$).

Table (3): Effect of spraying hatching eggs by garlic oil on Growth performance of chicks during the first four weeks of age

Traits	Treatments				Pooled SEM	Sig
	T1	T2	T3	T4		
Initial body weight (g)	34.22	34.22	35.56	36.22	0.36	N.S
Final body weight (g)	257.14^{b}	248.57^{c}	255.68^{b}	264.63^{a}	1.83	*
Chang of body weight (g)	222.22^{b}	214.53^{c}	220.12^{b}	228.4^{a}	1.61	*
Feed conversion (gf. gw)	2.03	2.21	2.00	2.02	0.039	N.S
Mortality %	6.82^{ab}	9.09^{a}	4.54^{bc}	2.27^{c}	0.94	*

a,b,c, means in the same row bearing different superscript are significantly different ($P \leq 0.05$).

Table (4): Effect of spraying hatching eggs by garlic oil on some hatched chick measurements relative carcass weights of hatched chicks

Traits	Treatments				Pooled SEM	Sig
	T1	T2	T3	T4		
Chick length (cm)	18.25^{a}	16.25^{b}	19^{a}	19.1^{a}	0.38	*
Chick shank length (cm)	5	5	5.1	5	0.018	N.S
Liver weight %	3.43	2.98	3.01	3.14	0.088	N.S
Gizzard weight %	5.38	5.07	5.36	5	0.075	N.S
Heart weight %	0.727	0.7	0.69	0.78	0.016	N.S
Yolk residual weight %	9.19^{a}	10.24^{a}	9.19^{a}	5.99^{b}	0.73	*
Spleen weight %	0.03^{b}	0.053^{a}	0.027^{b}	0.03^{b}	0.003	*
Bursa weight %	0.2^{a}	0.08^{d}	0.15^{b}	0.11^{c}	0.013	*

a,b,c,:means in the same row bearing different superscript are significantly different ($P \leq 0.05$).

Table (5): Effect of spraying hatching eggs by garlic oil on chick length and chick shank lengths with some relative carcass characters for chicks at 28th day of age

Traits	Treatments				Pooled SEM	Sig
	T1	T2	T3	T4		
Chick length (cm)	37.95	37.20	39.8	41	0.718	N.S
Chick shank length (cm)	10.7	10.2	10.55	10.8	0.142	N.S
Liver weight %	3.97	3.62	3.9	3.68	0.117	N.S
Gizzard weight %	4.75	5.59	4.6	5.18	0.19	N.S
Heart weight %	0.8^{a}	0.72^{b}	0.64^{c}	0.72^{b}	0.018	N.S
Spleen weight %	0.26^{b}	0.33^{ab}	0.41^{ab}	0.46^{a}	0.029	*
Bursa weight %	0.29^{b}	0.47^{a}	0.20^{b}	0.21^{b}	0.034	*

a,b,c, :means in the same row bearing different superscript are significantly different ($P \leq 0.05$

Table (6): Effect of spraying hatching eggs by garlic oil on blood constituents and some hematological parameters of Sinai chicks at hatch

Traits	Treatments				Pooled SEM	Sig
	T1	T2	T3	T4		
Blood constituents						
Total protein (g/dl)	2.82^{b}	2.83^{b}	2.82^{b}	3.2^{a}	0.052	*
Albumin (g/ dl)	1.61^{b}	1.51^{c}	1.52^{c}	1.73^{a}	0.028	*
Cholesterol (mg/dl)	435.3^{b}	492.3^{a}	396^{b}	384^{b}	14.46	*
Triglyceride (mg/dl)	73^{ab}	58.2^{b}	84.5^{a}	81.1^{a}	3.94	*
HDL (mg/dl)	49.33^{ab}	46.5^{b}	51.0^{a}	52.5^{a}	0.24	*
LDL (mg/dl)	372.8^{b}	428.4^{a}	326.6^{b}	321.2^{b}	14.82	*
VLDL (mg/dl)	14.6^{a}	11.61^{a}	16.9^{a}	16.2^{a}	0.79	*
T.A.O.C	0.32^{bc}	0.26^{c}	0.39^{b}	0.56^{a}	0.035	*
Glucose (mg/dl)	$304^{a\,b}$	347^{a}	264^{b}	258^{b}	12.3	*
Hematological parameters						
Hemoglobin(g/dl)	9.4	9.1	11.20	11.93	0.66	N.S
R.B.Cs (10^6/mm^3)	1.93	1.87	2.21	2.25	0.12	N.S
Hematocrit%	26.1	24.4	30.9	31.82	1.8	N.S
W.B.Cs (10^3/mm^3)	139	130	156	160	9.11	N.S

a,b,c, :means in the same row bearing different superscript are significantly different ($P \leq 0.05$

Table (7): Effect of spraying hatching eggs by garlic oil on blood constituents and some hematological parameters of Sinai chicks at 28 thday of age

Traits	Treatments				Pooled SEM	
	T1	T2	T3	T4		
Blood constituents						
Total protein(g/dl)	2.69	2.79	2.8	2.74	0.04	N.S
Albumin (mg/dl)	1.53	1.7	1.67	1.6	0.036	N.S
Cholesterol(mg/dl)	119.0^{ab}	134.4^{a}	111.5^{b}	110.5^{b}	3.93	*
Triglyceride(mg/dl)	46^{b}	44^{b}	64.2^{ab}	78^{a}	5.36	*
HDL(mg/dl)	47.2	42.5	47.5	41	2.12	N.S
LDL(mg/dl)	67.3^{a}	74.37^{a}	60.7^{ab}	38.4^{b}	5.19	*
VLDL(mg/dl)	9.2^{b}	8.8^{b}	12.84^{ab}	15.6^{a}	1.07	*
T.A.O.C	6.91^{ab}	4.81^{b}	7.02^{ab}	8.44^{a}	0.49	*
Glucose(mg/dl)	455^{b}	554^{a}	446^{b}	368^{b}	23.3	*
Hematological parameters						
Hemoglobin(g/dl)	11.8	12.45	12.3	12.65	0.18	N.S
R.B.Cs(10^6/mm^3)	2.84	2.54	2.43	2.73	0.07	N.S
Hematocrit %	32	32.4	31.7	33.75	0.9	N.S
W.B.Cs(10^3/mm^3)	137.2^{b}	178.4^{b}	198.9^{a}	201^{a}	8.75	*

a,b,c, :means in the same row bearing different superscript are significantly different ($P \leq 0.05$

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الملخص العربى

تأثير رش بيض التفريخ بمحلول زيت الثوم على صفات الفقس ونمو الكتاكيت بعد الفقس والإستجابة الفسيولوجية لكتاكيت سيناء الفاقسة

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تهدف هذه الدراسة إلى معرفة تأثير رش البيض بتركيزات مختلفة من زيت الثوم على بعض صفات التفريخ ووزن الكتاكيت عند الفقس ونمو الكتاكيت بعد الفقس على عمر ٢٨ يوم وكذلك الاستجابة الفسيولوجية لكتاكيت سينا . أستخدم عدد ٦٠٠ بيضة تفريخ من دجاج سينا المحلى فى تصميم تام العشوائية وتم تقسيمهم الى ٤ معاملات كل معاملة قسمت الى ٣ مكررات . وكانت المعاملات كالاتى :
معاملة اولى كنترول موجب حيث تم تبخير البيض بالفورمالدهيد ، المعاملة الثانية كنترول سالب حيث تم رش البيض بماء مقطر ، المعاملة الثالثة تم رش البيض بمحلول زيت الثوم بتركز ٢ملى / لتر ، المعاملة الرابعه تم رش البيض بمحلول زيت الثوم بتركيز ٣ملى / لتر .
تشير النتائج المتحصل عليها الي الآتى:-
١- حدوث انخفاض معنوى فى نسبة الفقد فى وزن البيض خلال فترة تحضين البيض (٠الى ١٨ يوم) عن طريق رش البيض بزيت الثوم
٢- حدوث تحسن معنوى فى نسبة تفريخ البيض المخصب ونسبة النفوق للاجنة ووزن الكتاكيت الفاقسة ومحصول الكتاكيت عند الفقس من خلال رش البيض بمحلو زيت الثوم
٣- رش البيض بمحلول زيت الثوم (٢ملى او٣ ملى / لتر ماء) ادى الى حدوث زيادة معنوية فى وزن الجسم النهائى ومعدل الزيادة الوزنيية ونسبة النفوق عند عمر ٢٨ يوم
٤- حدوث تحسن معنوى فى بعض صفات الذبيحة عند الفقس وعند عمر ٢٨ يوم نتيجة رش البيض بمحلول زيت الثوم مقارنة بالكنترول
٥- المعاملة بزيت الثوم سواء تركيز ٢ملى او ٣ ملى ادى حدوث تاثير معنوى فى بعض مكونات الدم عند الفقس وعند عمر ٢٨ يوم من النمو .
تشير النتائج إلى انه يمكن استخدام محلول زيت الثوم (٢ مل / لتر أو ٣ مل / لتر) كمادة طبيعية لرش البيض كطريقة جيدة لتحسين صفات الفقس ونمو الكتاكيت بعد الفقس والاستجابة الفسيولوجية لكتاكيت سيناء